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AUTHOR Fraser, Barry J.
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ABSTRACT

This study involved the development, validation, and use of the Individualized Classroom Environment Questionnaire (ICEQ), which measures classroom environment perceptions along dimensions (Personalization, Participation, Independence, Investigation, Differentiation) which differentiate individualized classes from conventional ones. The ICEQ measures student or teacher perceptions of actual or preferred classroom environment. Data from a sample of 766 students and their 34 teachers supported the ICEQ's internal consistency, discriminant validity, and ability to differentiate between the perceptions of students in different classrooms. Use of ICEQ scales as predictor variables revealed, first, that student perceptions accounted for a significant increment in the variance in affective but not cognitive outcomes and, second, that students achieved cognitive aims better when in their preferred classroom environment. Also, certain factors in the school-level environment were found to be associated with dimensions of classroom individualization. (Author/GK)

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CRITERION VALIDITY OF AN INDIVIDUALISED CLASSROOM ENVIRONMENT QUESTIONNAIRE

BARRY J. FRASER

MACQUARIE UNIVERSITY

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REPORT TO EDUCATION RESEARCH AND DEVELOPMENT COMMITTEE

JULY 1980

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PREFACE

This report describes a research program involving the development, validation and use of the Individualised Classroom Environment Questionnaire (ICEQ), an instrument which differs from other widely used classroom environment scales in two key ways. First, the ICEQ measures important dimensions which differentiate individualised classrooms from conventional ones. Second, whereas most other classroom environment instruments measure only student perceptions of actual environment, the ICEQ also measures student perceptions of preferred environment, teacher perceptions of actual environment and teacher perceptions of preferred environment.

Although ERDC funding supported only parts of this research program (in particular, those dealing with criterion validity), this report covers all phases of the research. The reason for describing the entire research program is to make this work accessible to wider audiences and to assist other researchers who might profitably incorporate the ICEQ into their own studies. In particular, others wanting to use the ICEQ might employ this report as a test manual because it contains a copy of the ICEQ and scoring directions and describes validation data and all prior studies using the ICEQ.

The initial development of the ICEQ and its use in several of the subsequent studies benefited greatly from collaboration with A. John Rentoul of Knox Grammar School in Sydney. His important contribution to the research program is acknowledged here.

This report should not be thought of as marking the termination of research efforts related to the ICEQ. Currently the author is conducting and planning further research which consolidates and extends the work described herein. Also the author has serviced requests for copies of the ICEQ from several hundred investigators from approximately ten countries. Over a dozen of these workers currently are using the ICEQ in their own research.

CHAPTER 1: INTRODUCTION

This introductory chapter briefly provides a review of prior classroom environment research and a historical account of the initial conception of the Individualised Classroom Environment Questionnaire (ICEQ). Also a brief overview of the structure of later chapters in the report is outlined.

PRIOR CLASSROOM ENVIRONMENT RESEARCH

Over the previous ten to fifteen years, considerable interest has been shown internationally in the conceptualisation, measurement and investigation of perceptions of psychosocial characteristics of classroom learning environment. Much of this effort has focussed around two simultaneous but independent research programs, one instigated by Herbert Walberg at the University of Illinois at Chicago Circle and the other by Rudolf Moos at Stanford University. These programs grew out of preliminary research work in the late 1960's associated with Harvard Project Physics in Walberg's case (Anderson and Walberg, 1974) and other environments including hospital wards, therapeutic groups and correctional institutions in Moos' case (Moos, 1976). The two instruments used most extensively in prior research are the Learning Environment Inventory (LEI) (Anderson and Walberg, 1976) and the Classroom Environment Scale (CES) (Trickett and Moos, 1973; Moos and Trickett, 1974), which measure student perceptions of psychosocial dimensions of the classroom like competition, formality, involvement, rule clarity, innovation and speed.

The field of classroom learning environment has become firmly established through a series of recent key publications. These include two books (Moos, 1979; Walberg, 1979), a monograph (Fraser, 1980a), a meta-analysis (Haertel, Walberg and Haertel, 1979), three major reviews (Walberg, 1976; Walberg and

Haertel, 1980; Fraser and Walberg, in press) and a special guest-edited issue of the journal Studies in Educational Evaluation (Fraser, 1980b).

The strongest tradition in past classroom environment research has involved investigation of the predictability of students' cognitive, affective, and behavioural outcomes from their perceptions of psychosocial characteristics of their classrooms. In fact, a large number of studies conducted in numerous countries has provided consistent and strong support for the incremental predictive validity of students' classroom perceptions in accounting for appreciable amounts of learning outcome variance beyond that attributable to student entry characteristics such as pretest and general ability.

Support for the predictive validity of students' classroom environment perceptions has come from studies conducted at the high school level in the United States (Walberg, 1969a, b, 1972; Trickett and Moos, 1974; Lawrenz, 1976; Moos and Moos, 1978), Canada (Walberg and Anderson, 1972; O'Reilly, 1975) and Israel (Hofstein, Gluzman, Ben-Zvi and Samuel, 1979). In Australia, a series of studies of junior high school students has demonstrated that classroom environment variables accounted for appreciable increments in variance in several cognitive and attitudinal measures beyond that attributable to corresponding pretest and general ability (Fraser, 1978a; 1979a; Rentoul and Fraser, 1980; Fisher and Fraser, in press). Also studies in several developing countries have supported the cross-cultural predictive validity of student perceptions of classroom learning environment; these include Walberg, Singh and Rasher's (1977) study of tenth grade students in India, Holsinger's (1972, 1973) study of primary school classes in Brazil, Chatiyanonda's (1978) study of senior high school classes in Thailand, and Paige's (1978) study of sixth grade classes in Indonesia.

This pattern of findings for the predictive validity is further illustrated by a recent meta-analysis - based upon 12 studies involving 17,805 students in 823 classrooms in eight subject areas in four nations - which revealed that

learning criteria consistently were positively associated with classroom environment variables such as cohesiveness and goal direction and negatively associated with variables such as friction and disorganisation (Haertel, Walberg and Haertel, 1979). Furthermore it was concluded that the magnitude of the outcome-environment relationship depended upon the dimension of classroom environment considered, the unit of statistical analysis and the nation in which the study was conducted, but not upon sample size, subject matter, type of learning outcome, or presence of control for pretest and general ability.

Prior research also has involved the use of student perceptions of classroom environment dimensions as criterion variables. When used in curriculum evaluation studies, classroom environment perceptions have differentiated revealingly, usefully and appreciably between classrooms following alternative curriculum materials (Anderson, Walberg and Welch, 1969; Cort, 1979; Fraser, 1979a; Levin, 1980). Other studies have established the criterion validity of classroom environment perceptions in differentiating between classrooms varying in class size (Walberg, 1969c, Anderson and Walberg, 1972), grade level (Welch, 1979) and subject matter (Anderson, 1971; Kuert, 1979).

INITIAL CONCEPTION OF ICEQ

The initial conception of the ICEQ grew out of the author's experience in conducting a major study in 1974 into the evaluation of the Australian Science Education Project (see Fraser, 1979a). Because ASEP's stated philosophy describes the type of classroom learning environment which would be promoted by using ASEP materials, student perceptions of classroom environment dimensions were employed as criteria of curricular effectiveness along with measures of cognitive and affective outcomes. When classes using ASEP materials were compared with classes following conventional materials,

it was found that differences in cognitive or attitudinal outcomes were generally small but differences on several classroom environment dimensions were appreciable and statistically significant. Furthermore this finding that classroom environment variables differentiated revealingly between alternative curricula when a variety of cognitive and affective outcome measures showed little sensitivity replicates the results of Welch and Walberg's (1972) study of Harvard Project Physics classes.

Experience gained during this evaluation of ASEP served to highlight two key issues. First psychosocial classroom processes are valuable ends in their own right and, consequently, evaluation studies should more often incorporate classroom environment dimensions as criterion variables (see Walberg, 1975; Fraser, 1980a). Second widely used classroom environment instruments including the LEI and CES fail to measure certain dimensions which are especially salient in classrooms described as open or individualised. In particular, the scales contained in existing classroom environment instruments do not tap salient aspects of ASEP classrooms such as emphasis on student choice, individual rates of working and involvement in inquiry based activities. Consequently, the author's research on ASEP involved development of a single new scale called Individualisation, which measures the extent to which students perceive their classrooms as individualised and self-paced (see Fraser, 1978b), and its use in conjunction with a modified version of the LEI.

While this single Individualisation scale provides a useful measure of an important aspect of classroom climate, clearly there is a need for a multidimensional instrument which yields a separate score for several important but logically distinct characteristics of individualised classrooms. Consequently, during 1977, the author began work on the development of a new instrument, the Individualised Classroom Environment Questionnaire (ICEQ), to measure perceptions of a number of distinct dimensions of classroom

individualisation (namely, Personalisation, Participation, Independence, Investigation and Differentiation).

Another feature of the ICEQ which distinguishes it from most other classroom environment instruments is that it measures, not only student perceptions of actual environment, but also student perceptions of preferred classroom environment, teacher perceptions of actual environment and teacher perceptions of preferred environment. Having these four different forms (called the Student Actual, Student Preferred, Teacher Actual and Teacher Preferred forms) enables the ICEQ to be used in exploring a variety of interesting research questions not previously possible using instruments with only one form. These questions include investigation of differences between student and teacher perceptions of the same classroom and between perceptions of actual and preferred environment. Other questions are whether relationships between student learning outcomes and actual classroom environment are mediated by student preferences for certain classroom environments.

The existence of Actual and Preferred forms of the ICEQ opens up the practical possibility of teachers using profiles of environment scores as a basis for reflection upon and subsequent improvement of their own classroom environments. In particular, by assessing students' perceptions of their actual and preferred classroom environment, data about actual-preferred discrepancies can be used as a basis for planning environmental changes which will align the actual environment with students' preferred environment. Although profiles of milieu inhabitants' perceptions of actual and preferred environment scores have been employed successfully in facilitating environmental change in psychiatric wards (Pierce, Trickett and Moos, 1972) and in alcoholism treatment programs (Bliss, Moos and Bromet, 1976), educators to date have paid surprisingly little attention to this potentially useful approach. Nevertheless, an original contribution to this area has been made in a recent chapter (Fraser, 1980a, ch. 5) which illustrates various ways

that classroom environment data can be processed to form profiles useful in guiding systematic attempts to improve classroom environments.

OVERVIEW OF OTHER CHAPTERS

Whereas this chapter provides some information about the initial conception of the ICEQ, Chapter 2 is devoted to a more detailed discussion of the ICEQ's development and to reporting a variety of validation data. Chapter 3 discusses several studies of the predictive validity of the ICEQ (i.e., its ability to predict student cognitive and affective learning outcomes). One of these studies breaks new ground as it explores a person-environment fit hypothesis involving relationships between student learning outcomes and the congruence between actual and preferred classroom environment. Although ERDC funding did not support the development and validation of the ICEQ nor its use in predictive validity studies, this work is still included in the present report for completeness and to facilitate other researchers' use of the ICEQ.

Chapter 4 reports several criterion validity studies (i.e., research in which the ICEQ is used as a source of dependent variables). These studies include: the ability of the Actual forms of the ICEQ to differentiate between classes using individualised curriculum materials and those following conventional materials; use of the Student Actual form in schools attempting innovations in individualisation; changes in beginning teachers' preferences for classroom individualisation; and predictors of preferred and actual classroom individualisation among beginning teachers. Chapter 5 provides a brief summary of the report, draws some conclusions and identifies several potentially fruitful areas for future research.

CHAPTER 2: DEVELOPMENT AND VALIDATION OF ICEQ

A detailed description of the nature, development and validation of the ICEQ would provide readers with background information essential to a complete understanding of later chapters of this report, and would make the ICEQ accessible to other researchers who might wish to use it. This chapter outlines the ICEQ's initial development, describes its scales and items, presents some initial normative data and reports validation data. These validation data describe the internal consistency, discriminant validity, test-retest reliability, ability to differentiate between classrooms, and associations between teacher and student perceptions of the same classrooms for each ICEQ scale.

DEVELOPMENT OF ICEQ

Development Strategy

A comprehensive description of the initial development of the ICEQ is contained in Rentoul and Fraser (1979) and Fraser (1980a). The ICEQ's development was guided by the following three criteria:

1. Dimensions chosen characterised the classroom learning environment described in the literature of individualised education, including open and inquiry-based classrooms (e.g., Rathbone, 1971; Weisgerber, 1971; Traub, Weiss, Fisher and Musella, 1972; Walberg and Thomas, 1972; Elliott and Adelman, 1975) and in individualised curriculum materials.

2. Dimensions chosen provided coverage of the three general categories of dimensions delineated by Moos (Insel and Moos, 1974; Moos, 1974) for conceptualising human environments. These three general categories are Relationship Dimensions (nature and intensity of personal relationships), Personal Development Dimensions (basic directions along which personal growth and self-enhancement tend to occur) and System Maintenance and System Change Dimensions (extent to which the environment is orderly, clear in expectation, maintains control, and is responsive to change).

3. Dimensions chosen and individual questionnaire items were considered salient and suitable by a group of educational researchers, practising teachers and secondary school students.

After extensive literature analysis and interviewing of students and teachers, it was found that the above criteria could be satisfied with the following five dimensions: Personalisation, Participation, Independence, Investigation and Differentiation.

It was noted in the previous chapter that an important feature of the ICEQ which distinguishes it from most other classroom environment instruments is that it has four distinct forms which measure:

. student perceptions of actual classroom environment (Student Actual form)
. student perceptions of preferred classroom environment (Student Preferred form
. teacher perceptions of actual classroom environment (Teacher Actual form)
. teacher perceptions of preferred classroom environment (Teacher Preferred form

The preferred environment forms of the ICEQ are concerned with goals and value orientations as they measure student and teacher perceptions of the classroom environment they would ideally like or prefer. Having these four different forms enables the ICEQ to be used in investigating differences between teachers and students in their perceptions of actual and preferred classroom environment, relationships between student learning outcomes and discrepancies between actual and preferred classroom environment, and ways in

which classroom practices might be changed in order to make the actual classroom environment more congruent with preferred environment as perceived by students or teachers.

The writing of an initial pool of items measuring each ICEQ dimension was one of the first steps. As identical item wording (but different instructions) was to be used in all four forms of the ICEQ, it was important to check that each item was suitable for measuring both actual and preferred environment, and that the language was potentially readable by secondary school students but did not "talk down" to teachers. A most important step in developing the ICEQ involved modifying the original pool of items after receiving reactions solicited from groups of educational researchers, practising teachers and junior high school students. The last step consisted of further refining the scales to form a final version by application of item analysis techniques to data collected from several different samples of teachers and students (see Rentoul and Fraser, 1979).

Description of ICEQ

The final version of the ICEQ contains 50 items, with each of the five dimensions being assessed by 10 items. The item wording is identical in all four forms of the ICEQ, but a different set of instructions is used for each form. Each item is scored on a five-point scale with responses of Almost Never, Seldom, Sometimes, Often and Very Often. The scoring direction is reversed for approximately half of the items. Table 1 further clarifies the nature of the ICEQ by showing the classification of each scale according to Moos' scheme and by providing a scale description and sample item for each scale.

TABLE 1. Descriptive Information for Each Scale of ICEQ

Scale Name	Moos' General Category	Description of Scale	Sample Item
Personalisation	Relationship	Emphasis on opportunities for individual students to interact with the teacher and on concern for the personal welfare and social growth of the individual.	The teacher considers students' feelings. (+)
Participation	Relationship	Extent to which students are encouraged to participate rather than be passive listeners.	The teacher lectures without students asking or answering questions. (-)
Independence	Personal Development	Extent to which students are allowed to make decisions and have control over their own learning and behaviour.	Students choose their partners for group work. (+)
Investigation	Personal Development	Emphasis on the skills and processes of inquiry and their use in problem-solving and investigation.	Students find out the answers to questions and problems from the teacher rather than from investigations. (-)
Differentiation	System Maintenance	Emphasis on the selective treatment of students on the basis of ability, learning style, interests and rate of working.	Different students use different books, equipment and materials. (+)

Items designated (+) are scored 1, 2, 3, 4, 5, respectively for the responses Almost Never, Seldom, Sometimes, Often, Very Often.
Items designated (-) are scored in the reverse manner.

The economy and convenience of the ICEQ is worth commenting upon. Either the actual or the preferred form of items in all five ICEQ scales can be administered to a class of junior high school students in about 20 minutes. Teachers usually take less than half this time to complete the questionnaire. As the questionnaire is reusable and occupies only one double-sided page, printing and collation costs are relatively small. Also a separate one-page response sheet makes scoring using computer or scoring keys simple.

Appendix A contains additional material which would enable interested workers to use the ICEQ in their own research. The first two pages of this appendix consist of a copy of the Student Actual form of the ICEQ. The third page contains the set of instructions for answering the ICEQ's other three forms, namely, Student Preferred, Teacher Actual and Teacher Preferred. Any of these three forms can be assembled simply by combining the appropriate set of instructions with the common set of questionnaire items. The fourth page of Appendix A provides a response sheet for the ICEQ. On the fifth page, a table gives the scale allocation and scoring direction of each item. This page can be used to guide computer scoring of responses or as a basis for constructing a separate transparent scoring key (perhaps using an overhead projector sheet) for each scale.

Preliminary Normative Data

Normative data based on a large and representative Australian sample are not yet available. Nevertheless, some preliminary normative data are available for all four forms of the ICEQ for a sample of 34 teachers and their 766 junior high school students. While acknowledging that this sample is not representative in all respects, data are provided at this time to assist others using the ICEQ to make more meaningful interpretations of their results.

The sample consisted of 34 beginning teachers in their first year of full-time teaching during 1978. These teachers received their preservice teacher education at Macquarie University and each was teaching in a different

government high school in New South Wales. Also each of these teachers selected one of his/her science or social science classes (e.g., history, geography, social studies) at the junior high school level for participation in the study. This provided a student sample of 766 pupils in 34 different classes (each in a different school). Approximately equal numbers of science and social science classes and approximately equal numbers of boys and girls made up the sample. Thirteen classes were at the Year 7 level, 14 classes were at the Year 8 level and seven classes were at the Year 9 level. While 15 schools were in the metropolitan area of Sydney, the other 19 schools were in country areas of New South Wales.

Table 2 shows the value of the mean and standard deviation for each of the four forms of each ICEQ scale obtained when the actual and preferred forms were administered to the sample of 766 students and 34 teachers described above. As the scale means were very similar whether the individual student or the student class mean was used as the unit of analysis, only one figure is given for each student mean. On the other hand, because student standard deviations varied markedly depending on whether the individual or the class mean was used as the unit of analysis, Table 2 provides standard deviations for the student forms of the ICEQ separately for the two units of analysis.

There are notable differences in means on the four forms of the ICEQ (Student Actual, Student Preferred, Teacher Actual, Teacher Preferred) discernible from Table 2. These differences form the basis for further analysis and discussion in Chapter 4.

TABLE 2. Scale Means and Standard Deviations for each Form of ICEQ

	Mean				Standard Deviation of Individual Scores				Standard Deviation of Class Means	
	Student actual[a]	Student pref.[a]	Teacher actual[b]	Teacher pref.[b]	Student actual[c]	Student pref.[c]	Teacher actual[b]	Teacher pref.[b]	Student actual[b]	Student pref.[b]
Personalisation	31.5	38.6	38.1	42.9	6.6	6.4	5.4	3.5	2.9	2.3
Participation	34.1	37.5	36.5	41.0	5.3	5.6	5.0	4.0	2.1	2.1
Independence	26.4	31.9	24.8	25.7	6.4	6.6	6.2	5.9	3.5	2.2
Investigation	28.4	31.7	30.5	38.7	5.5	6.8	6.4	6.0	2.0	2.3
Differentiation	20.5	24.4	23.6	28.4	4.7	6.3	5.0	5.4	2.7	2.0

[a] Means were approximately the same using the 766 individual student scores or the 34 class means.

[b] Sample size was 34.

[c] Sample size was 766.

VALIDATION OF ICEQ

This section presents data about five statistical characteristics relevant to the validity of scales. These are internal consistency, discriminant validity, test-retest reliability, ability to differentiate between the perceptions of students in different classrooms, and associations between teacher and student perceptions of the same classrooms.

Internal Consistency

A desirable characteristic of any measuring instrument is internal consistency (the extent to which items in the same scale measure the same dimension). Estimates of the internal consistency of the four forms of each ICEQ scale were calculated using Cronbach's alpha coefficient for the previously described sample of 766 students and 34 teachers. Furthermore, because both the individual student and the class mean have been used commonly in past classroom environment research, it was considered desirable to provide indices of the internal consistency of class means for the student forms of ICEQ. These estimates were made using Shaycoft's (1962) procedure which can be used to calculate class reliability from information about the reliability coefficient for individuals and the scale standard deviation for both individuals and class means.

Table 3 shows the estimates obtained for the alpha coefficient of each ICEQ scale and for each form of the ICEQ. For the student forms of the instrument, these estimates are reported separately for the individual and the class mean as the unit of statistical analysis. The values of the alpha coefficient shown in Table 3 suggest that each ICEQ scale has acceptable internal consistency for use in each of its four forms and with either the individual student or the class mean as the unit of analysis.

TABLE 3. Alpha Reliability and Mean Correlation of a Scale with Other Four Scales for each Form of ICEQ for Two Different Units of Analysis

Scale Name	Unit of Analysis	Alpha Reliability				Mean Correlation with Other Scales			
		Student actual	Student pref.	Teacher actual	Teacher pref.	Student actual	Student prer.	Teacher actual	Teacher pref.
Personalisation	Individual	0.79	0.71	0.88	0.74	0.28	0.30	0.26	0.29
	Class	0.95	0.90			0.27	0.33		
Participation	Individual	0.70	0.69	0.82	0.82	0.27	0.29	0.36	0.34
	Class	0.92	0.90			0.29	0.35		
Independence	Individual	0.71	0.70	0.86	0.86	0.09	0.16	0.26	0.25
	Class	0.96	0.88			0.17	0.17		
Investigation	Individual	0.69	0.77	0.89	0.90	0.16	0.24	0.34	0.33
	Class	0.90	0.91			0.25	0.33		
Differentiation	Individual	0.61	0.71	0.75	0.81	0.07	0.18	0.25	0.16
	Class	0.95	0.87			0.14	0.28		
Mean for Five Scales:	Individual	0.70	0.72	0.84	0.83	0.17	0.23	0.29	0.27
	Class	0.94	0.89			0.22	0.30		

Discriminant Validity

Table 3 also reports data about discriminant validity (the extent to which a given scale measures a unique dimension not measured by other scales in the instrument). The convenient index of discriminant validity used in this table is the mean correlation of a scale with the other four scales. These statistics have been calculated for student forms of the ICEQ separately using the individual and the class mean as the unit of analysis. Table 3 indicates that the values of the mean correlation of a scale with the other scales are small enough to suggest that each ICEQ scale has adequate discriminant validity for use in each of its four forms and with either the individual student or the class mean as the unit of analysis. In turn, this suggests that the ICEQ measures distinct although somewhat overlapping aspects of classroom environment.

Test-retest Reliability

The test-retest reliability coefficient measures the stability of a scale over time, and is calculated simply by taking the correlation between the scale scores obtained by the same sample on two different occasions. Some preliminary information about the test-retest reliability of the ICEQ was obtained for a sample of 105 junior high school students in suburban Sydney schools responding to the Actual form of the questionnaire on two occasions three weeks apart. Test-retest reliability coefficients were found to be 0.78 for Personalisation, 0.67 for Participation, 0.83 for Independence, 0.75 for Investigation and 0.78 for Differentiation. These data suggest that the Student Actual form of the ICEQ displays satisfactory test-retest reliability.

Ability to Differentiate between Classrooms

Another desirable characteristic of any classroom environment instrument is that it is capable of differentiating between the perceptions of students in different classrooms. That is, students within the same class should perceive it relatively similarly, while mean within-class perceptions should vary from classroom to classroom. This characteristic was explored for each scale of the Actual form of the ICEQ using the sample of 766 students. This involved performing a one-way ANOVA, with class membership as the main effect and using the individual as the unit of analysis, to obtain information about the ratio of between-class to within-class variance. The results of these analyses are shown in Table 4 which indicates that each ICEQ scale differentiated significantly ($p < .01$) between classrooms. Also the eta^2 statistic, which is the ratio of between to total sums of squares (Cohen and Cohen, 1975), was calculated as an estimate of the amount of variance in ICEQ scores attributable to class membership. This table shows that the proportion of variance accounted for by class membership ranged from 15 per cent for the Investigation scale to 33 per cent for the Independence scale.

Associations between Teacher and Student Actual Scores

If the Actual forms of the ICEQ really measure actual classroom environment, there should be a sizable positive association between teacher and student perceptions of the actual environment of the same classrooms. Notwithstanding important differences between the classroom environment perceptions of teachers and students, a sizable association between teachers' actual scores and the class means of students' actual scores needs to exist in order to support the concurrent validity of the ICEQ's Actual forms.

TABLE 4. ANOVA Results for Class Membership Differences in Student Perceptions of Actual Classroom Environment

ICEQ Scale	MS Between	MS Within	df	F	Eta^2
Personalisation	174.3	35.0	33, 732	5.0**	0.19
Participation	98.5	23.2	33, 732	4.2**	0.17
Independence	248.3	23.9	33, 732	10.4**	0.33
Investigation	106.6	27.6	33, 732	3.9**	0.15
Differentiation	107.7	16.2	33, 732	6.6**	0.24

** $p<.01$

Eta^2 is the ratio of between to total sums of squares and indicates proportion of variance explained by class membership.

Two different statistics were calculated to describe associations between teachers' actual scores and students' class mean actual scores for the sample of 34 classes. Firstly, product-moment correlations between teachers' and students' scores were calculated separately for each scale for the 34 pairs of scores. Correlations were found to be 0.64 for Personalisation, 0.50 for Participation, 0.12 for Independence, 0.52 for Investigation and 0.37 for Differentiation, and to have a mean of 0.43 across the five scales. Secondly, in order to provide an index of the similarity of the teacher's profile to the students' mean profile for a particular classroom, a Spearman rank order correlation coefficient was calculated separately for each of the 34 classrooms for the set of five teacher/student pairs. The rank order coefficient was chosen because it is nonparametric and, consequently, is suitable for use in the present situation where the small sample size of five scales would invalidate the use of the product-moment coefficient (see Siegel, 1956). The mean rank order coefficient was found to be 0.78, with coefficients ranging from -0.13 to 1.00 for different classrooms. The results of these two types of analysis taken together generally indicate the presence of quite sizable associations between teacher and student perceptions of actual classroom environment, and support the concurrent validity of the Actual forms of the ICEQ.

It is interesting to note that these results for associations between teacher and student perceptions on the Actual forms of the ICEQ are reasonably similar to those reported by Moos (1979, p. 148) for the Classroom Environment Scale (CES). For a sample of 295 U.S. teachers and classes, the product-moment correlation averaged across the nine CES scales was 0.50 and the rank order correlation for CES profiles averaged across classrooms was 0.47.

CONCLUSION

By describing the development of the ICEQ, this chapter has provided a foundation to facilitate understanding of following chapters of this report. Information provided here about the nature of the ICEQ also should assist workers contemplating its use in their own research. This chapter also has reported extensive data which supports the validity of the ICEQ and which should increase other researchers' confidence in using the instrument. In particular, it was found that all four forms of each ICEQ scale displayed adequate internal consistency and discriminant validity, and that data indicated satisfactory test-retest reliability, ability to differentiate between classrooms and sizable positive associations between teacher and student perceptions of the same classrooms.

CHAPTER 3: PREDICTIVE VALIDITY OF ICEQ

It was noted in Chapter 1 that one of the strongest traditions in past classroom environment research has involved investigation of the predictability of students' cognitive and affective learning outcomes from their perceptions of psychosocial characteristics of their classrooms. Moreover numerous research programs involving many thousands of students from various nations have provided convincing and consistent support for the incremental predictive validity of student perceptions in accounting for appreciable amounts of variance in learning outcomes beyond that attributable to initial student characteristics such as pretest performance and general ability (see Fraser, 1980a).

To date two important studies have investigated the incremental predictive validity of student perceptions on the Actual form of the ICEQ. The first of these studies involved two cognitive and one affective outcomes. In the light of findings from the first study, a second predictive validity study was undertaken using a set of seven attitudinal outcomes. These two studies are discussed in the first two sections of this chapter.

While prior research has concentrated on the predictive validity of student perceptions of actual classroom environment, having Actual and Preferred forms of the ICEQ enables a confluence of two previously distinct research traditions - person-environment fit research (Hunt, 1975) and classroom learning environment research. The third section of this chapter describes a person-environment fit study in which the ICEQ was used to provide a set of five dimensions characterising student perceptions of actual individualisation in the classroom environment and another set of five commensurate personal dimensions consisting of student perceptions of their

preferred environment. Relationships between learning outcomes and actual-preferred congruence (i.e., person-environment fit) were then tested to explore the intuitively plausible notion that students who differ in their preferences for classroom individualisation could achieve differentially depending upon the amount of actual individualisation present in their classrooms.

STUDY OF TWO COGNITIVE AND ONE AFFECTIVE OUTCOMES

The first predictive validity study employing the ICEQ involved two cognitive and one affective learning outcomes. This study was conducted during 1978 and involved the 15 suburban classes which were contained in the larger sample of 34 classes described in Chapter 2 and used in various other analyses throughout this report. A more detailed description of this study is reported in Rentoul and Fraser (1980).

Design of Study

The sample consisted of 285 students in 15 junior high school classrooms, each in a different government school in the Sydney metropolitan area. Nine of these classes were science classes while six were social science classes. The numbers of classes at the Year 7, 8 and 9 levels were five, eight and two, respectively. The numbers of boys and girls were approximately equal.

Learning outcomes were measured by a battery of three measures administered as pretests at the beginning of the 1978 school year and again as posttests at the end of the same school year. The ICEQ was administered at mid-year to obtain students' perceptions of the five dimensions of actual classroom individualisation. In addition, the two student characteristics of general ability and sex were also included in the study as these have been found consistently to be linked with learning on many different criteria in many different contexts (Lavin, 1965). The basic design of the study, then, involved the prediction of posttest performance on each of the three learning

criteria from the corresponding pretest, the two student characteristics of general ability and sex and the five actual individualisation variables.

The two cognitive outcome measures, which were selected from a wider battery of inquiry skill tests (Fraser, 1979b, 1980c), are called Library Usage (skill at using dictionaries, encyclopaedias, library catalogues, etc.) and Charts and Tables (skill at interpreting a variety of charts and tables). The Library Usage and Charts and Tables scales consist of 10 and 11 multiple-choice items, respectively, and were reported to have internal consistency reliabilities (KR-20 coefficients) of 0.65 and 0.72, respectively, for an Australian sample of 1,158 seventh year students, and to have test-retest reliabilities of 0.74 and 0.65, respectively, for a sample of approximately 100 seventh year students. Key advantages of these tests are that they are content-free and measure important aims common to both science and social science subjects. The attitude scale is called Enjoyment of Lessons and, as the name suggests, measures student enjoyment of their science or social science lessons. This attitude scale, which consists of 10 Likert-type items, is similar to one of the scales contained in the Test of Science-Related Attitudes (Fraser, 1978c, 1980d) except for minor rewording to make items suitable for either science or social science classrooms. When the original attitude scale was administered in Australian science classrooms at the junior high school level, it was found to have an internal consistency reliability (alpha coefficient) of 0.93 for a sample of 1,337 students, and to have a test-retest reliability of 0.78 for a sample of 238 students.

The study was viewed as exploratory since it represented the first use of the ICEQ in investigating predictive validity. Because of its exploratory nature, the research involved only a relatively small sample of 15 schools. In turn the smallness of this sample necessitated the use of the individual instead of the class mean as the unit of statistical analysis. Since the choice of an appropriate unit of statistical analysis is an important issue (see Ross, 1978; Sirotnik, 1979), caution should be exercised in placing too

much weight on the results emerging from the present study until they are replicated in future research involving larger samples.

Analyses and Results

Multiple regression analysis was chosen as an appropriate technique for several reasons outlined by Kerlinger and Pedhazur (1973) and Cohen and Cohen (1975). Multiple regression enabled statistical power to be maximised by maintaining ICEQ scale scores as continuous variables. Another advantage was that multiple regression techniques could be employed to test the combined effects of sets of variables, a facility useful in the present study because it permitted the use of the condition that tests would be performed for individual ICEQ scales only if the variance attributable to the corresponding set of five ICEQ scales was found to be significant at the 0.05 level of confidence. This condition was employed in order to maintain adequate statistical power while controlling the Type I error rate associated with performing large numbers of significance tests for individual predictors.

The hierarchical regression approach was used so that the effect of classroom environment variables could be estimated in terms of an increment in criterion variance accounted for beyond that attributable to corresponding pretest, general ability and sex. This approach is consistent with prior research and provides a conservative test of whether classroom environment perceptions are related to learning outcomes when the variance attributable to well-known and better established predictors has been removed. That is, for reasons of simplicity, learning environment dimensions can be considered useful predictors of learning outcomes only if they account for different variance from that attributable to well established predictors.

TABLE 5. Percentage of Variance in each of Three Learning Outcome Posttests Accounted for by Corresponding Pretest, Two Student Characteristics and Five Actual Individualisation Scales

Outcome Posttest	Percentage of Posttest Variance				
	Blocks of Predictors				
	R^2(%) for Full 8-Term Model	r^2(%) for Corres. Pretest	ΔR^2(%) for 2 Student Variables	ΔR^2(%) for 5 ICEQ Scales	ΔR^2(%) for Significant Individual Predictors
Library Usage	19.7**	14.8**	3.4**	1.5	
Charts and Tables	22.5**	18.2**	3.2**	1.1	
Enjoyment of Lessons	39.5**	35.0**	0.8	3.7**	H 1.5** (Person.) H 0.9* (Partic.)

* p<.05, ** p<.01

H Higher scores on the predictor variable (e.g., Personalisation) were associated with higher posttest scores.

Table 5 shows the results obtained when a hierarchical regression analysis was performed separately for the two cognitive posttests (Library Usage and Charts and Tables) and the affective posttest (Enjoyment of Lessons). The first column of figures indicates that the full eight term model accounted for a significant ($p < .01$) amount of variance ranging from 19.7 to 39.5 per cent for the different outcome posttests. The second column of figures shows that the amount of posttest variance associated with the corresponding pretest was 14.8 and 18.2 per cent, respectively, for the two cognitive criteria and 35.0 per cent for the affective criterion. A significant relationship ($p < .01$) existed between pretest and posttest performance on all three learning outcomes. The third column of figures indicates that the increment in posttest variance associated with the block of student characteristics (beyond that attributable to the corresponding pretest) was 3.4 and 3.2 per cent, respectively, for the cognitive outcomes and 0.8 per cent for the affective outcome. This increment in posttest variance associated with student characteristics was significant ($p < .01$) for the two cognitive outcomes but nonsignificant for the affective outcome. The fourth column of figures in Table 5 shows that the increment in posttest variance associated with the block of five individualisation dimensions (beyond that attributable to the corresponding pretest and the two student characteristics) was 1.5 and 1.1 per cent, respectively, for the cognitive outcomes and 3.7 per cent for the affective outcome. This increment in posttest variance associated with individualisation variables was significant ($p < .01$) for the affective outcome only.

The variance associated with the block of ICEQ dimensions was further partitioned for the one outcome (Enjoyment of Lessons) for which the block as a whole was associated with a significant increment in criterion variance. Table 5 shows that the Personalisation scale was associated with a significant increment of 1.5 per cent of posttest variance on Enjoyment of Lessons beyond that attributable to pretest and student characteristics. Also the Participation scale was associated with a further significant increment of 0.9 per cent of

posttest variance beyond Personalisation. The interpretation of these two significant findings for individual variables was that Enjoyment of Lessons scores were positively related to perceptions of increased classroom Personalisation and Participation.

It is noteworthy that the two individual dimensions of actual individualisation which were significantly related to Enjoyment of Lessons were Personalisation and Participation, which are the two ICEQ scales classifiable as Relationship Dimensions according to Moos' scheme. This finding replicates other research in the United States and developing countries in which Relationship Dimensions were consistently linked with interest in school subjects (see Moos, 1979, p. 256). It is interesting to note also that the present finding that actual classroom individualisation promoted affective but not cognitive outcomes is consistent with Horwitz's (1979) recent comprehensive review of open education studies.

STUDY OF SEVEN AFFECTIVE OUTCOMES

The study of the predictive validity of the Actual form of the ICEQ described in the previous section provided evidence of a reasonably strong relationship between the affective outcome and students' classroom environment perceptions. This promising finding provided the inspiration for instigating another study during 1979 into the predictability of a set of seven attitudinal outcomes from students' perceptions on the Actual form of the ICEQ. Further information about this study is provided in Fraser (1980e).

Design of Study

This study of the predictive validity of the ICEQ involved a sample of 320 Year 7 to 9 students in 14 science classes, each with a different teacher. These classes were spread throughout six representative schools (two private and four government) in suburban areas of Sydney. Approximately equal numbers of boys and girls made up the sample.

The student outcomes studied were the set of seven attitudinal criteria measured by the Test of Science-Related Attitudes (TOSRA) (Fraser, 1978c, 1980d). The seven scales are called Social Implications of Science (attitude to the social benefits and problems which accompany scientific progress), Normality of Scientists (appreciation that scientists are normal people rather than the eccentrics often depicted in the mass media), Attitude to Inquiry (attitude to scientific experimentation as a way of obtaining information about the natural world), Adoption of Scientific Attitudes (e.g., open-mindedness, willingness to revise opinions in the light of new evidence), Enjoyment of Science Lessons, Leisure Interest in Science, and Career Interest in Science. Alpha reliability coefficients for TOSRA scales were reported to range from 0.67 to 0.92 for a sample of 1337 Australian students in Years 7 to 10 (Fraser, 1980d).

The sample of 320 students responded to TOSRA at the beginning of the 1979 school year and again at the end of the same year. Student perceptions of actual classroom learning environment were measured with the ICEQ in the middle of the same year. This experimental design permitted examination of the predictability of end-of-year attitudes from classroom environment perceptions when corresponding beginning-of-year attitude scores were controlled statistically.

Analyses and Results

A notable feature of prior research into the predictive validity of students' classroom environment perceptions is that a variety of data analytic techniques has been used in exploring outcome-environment relationships. In the present study, it was decided to analyse data and report results in five different ways which reflect emphases in previous studies. Results obtained using these five methods of analysis are recorded in Table 6 for the sample of 320 students.

TABLE 6. Simple, Multiple, Semipartial Multiple and Canonical Correlation (Using Raw Posttest and Residual Posttest Scores) between Attitude Outcomes and Environment Dimensions

Scale	Simple Correlation, r					Multiple Correlation	Semipartial Multiple Correlation[a]
	Pers	Part	Indep	Invest	Diff	R	sR
Social Implications of Science	0.31**	0.24**	-0.01	0.25**	-0.02	0.35**	0.25**
Normality of Scientists	0.18**	0.26**	0.10	0.13*	0.04	0.30**	0.26**
Attitude to Inquiry	0.08	0.16**	-0.08	0.02	-0.18**	0.24**	0.22**
Adoption of Scientific Attitudes	0.28**	0.24**	-0.05	0.18**	-0.09	0.30**	0.23**
Enjoyment of Science Lessons	0.32**	0.26**	0.02	0.23**	-0.07	0.37**	0.27**
Leisure Interest in Science	0.29**	0.24**	-0.04	0.19**	-0.13*	0.32**	0.23**
Career Interest in Science	0.27**	0.23**	-0.02	0.21**	-0.04	0.30**	0.22**
					Canonical Correlation:	R_c=0.43** (Standard raw posttest scores)	R_c=0.40** (Standard residual posttest scores)[a]

* $p < .05$, ** $p < .01$

[a] Involves adjustment for corresponding pretest.

The first and least complex analysis reported in Table 6 is a simple correlational analysis involving scores on the seven attitude posttests and the five ICEQ scales. Results shown in this table indicate that 21 of the possible 35 correlations were significantly greater than zero ($p < .05$), which is 12 times that expected by chance.

Although the simple correlational analysis can provide useful information about relationships between particular attitudinal outcomes and particular environmental dimensions, the multiple correlation of the set of ICEQ scales with each attitude posttest can be considered more revealing. In particular, the multiple correlation provides a more parsimonious picture of the joint influence of correlated environment dimensions on outcomes, and reduces the experimentwise Type I error rate associated with the simple correlational analysis. Table 6 shows that the magnitude of the multiple correlation between scores on an attitude posttest and the set of ICEQ scales ranged from 0.24 for the Attitude to Inquiry scale to 0.37 for the Enjoyment of Science Lessons scale. Moreover these values were significantly greater than zero ($p < .01$) for each of the seven TOSRA scales.

It has been common in past predictive validity research to perform a conservative test of outcome-environment relationships by controlling statistically certain student characteristics, particularly performance on the parallel pretest. The last column of figures in Table 6 shows the value obtained for the semipartial multiple correlation between each outcome posttest and the set of five ICEQ scales when the effect of corresponding pretest was controlled. Although values of the semipartial multiple correlation (0.22 to 0.27) were somewhat smaller than the corresponding values of the multiple correlation, they were still found to be significantly greater than zero ($p < .01$) for each of the seven attitude scales. Furthermore, since the square of the semipartial multiple correlation represents the increment in explained variance (Cohen and Cohen, 1975), it can be seen that the set of ICEQ scales accounted for an increment of between approximately five and

seven per cent of the variance in different outcome posttests over and above that attributable to corresponding pretest. These results are similar to the finding reported in the first section of this chapter showing that student perceptions on the five ICEQ scales accounted for an increment of approximately four per cent in the variance in an attitudinal outcome.

Although the use of multiple correlations and semipartial multiple correlations overcomes the problem of colinearity between ICEQ scales, colinearity between outcome measures could still give rise to an inflated experimentwise Type I error rate. Canonical correlation analysis, however, can provide a parsimonious picture of relationships between the domain of correlated attitudinal outcomes and the domain of correlated environment characteristics. Consequently two canonical analyses were conducted using standard scores (i.e., scores defined as the number of standard deviations above or below the mean). The reason for using standard scores is that a more meaningful interpretation can be made of canonical weights if all variables in the analysis have been standardised. The first canonical analysis was analogous to the multiple correlational analysis in that it explored relationships between scores on the set of five environment scales and raw scores on the set of seven attitudinal posttest outcomes. The second canonical analysis was analogous to the semipartial multiple correlational analysis in that it explored relationships between scores on the set of five ICEQ scales and residual posttest scores (adjusted for corresponding pretest) on the set of seven attitudinal outcomes.

Table 6 shows that each canonical analysis revealed one significant canonical relationship ($p < .05$). A significant canonical correlation of 0.43 ($p < .01$) was found between environment scales and raw posttest scores on the attitude scales, and a significant correlation of 0.40 ($p < .01$) was found between environment scales and residual posttest scores on the attitude scales.

Each of the five separate analyses reported in Table 6 provides strong support for the predictive validity of the ICEQ. Each analysis, however, leads to a somewhat different interpretation of relationships between individual outcomes and individual environment dimensions. For example, the simple correlational analysis suggests that significantly more positive attitudes were expressed on all attitude scales except Attitude to Inquiry in classes perceived as having greater Personalisation, on all seven attitude scales in classes perceived as having greater Participation, on all attitude scales except Attitude to Inquiry in classes perceived as having greater Investigation, and on two attitude scales (Attitude to Inquiry and Leisure Interest in Science) in classes perceived as having less Differentiation. The most sophisticated analysis - the canonical analysis of the set of ICEQ scores and the set of posttest attitude scores residualised for corresponding pretest - revealed a somewhat different picture. An examination of the canonical weights for this analysis revealed that, with corresponding pretest controlled, more favourable attitudes on the Social Implications of Science, Normality of Scientists and Enjoyment of Science Lessons scales were found in classes perceived as being characterised by greater Personalisation, Participation, Independence and Investigation.

In summary, this section has explored relationships between end-of-year attitude outcomes and student perceptions of actual classroom environment dimensions using five different methods of data analysis. These were a simple correlational analysis, a multiple correlational analysis involving the prediction of each attitude posttest from the set of ICEQ scales, a semi-partial multiple correlational analysis involving the prediction of each attitude posttest from the set of ICEQ scales but with corresponding beginning-of-year attitude controlled, a canonical analysis involving ICEQ dimensions and raw scores on attitude posttests, and a canonical analysis involving ICEQ dimensions and residual attitude posttest scores adjusted for corresponding beginning-of-year attitude. Taken together, results from the five separate analyses provided strong and consistent support for the predictive validity

of student perceptions of classroom environment as measured by the Actual form of the ICEQ. It is noteworthy also that the results of the present study generally indicated positive associations between the degree of classroom individualisation and student attitudes. This general pattern of results is consistent with Horwitz's (1979) review of open education research which showed that, of 25 attitude studies with statistically significant results, attitudes were more favourable in open classrooms than in traditional classrooms in 23 of the studies.

PERSON-ENVIRONMENT FIT

In early but seminal works in psychology, Lewin (1936) and Murray (1938) have presented theoretical points of view which clearly recognise both the environment and its interaction with personal characteristics of the individual as potent determinants of human behaviour. The familiar Lewinian formula, $B=f(P,E)$, was first enunciated largely for didactic reasons to stress the need for new research strategies in which behaviour is considered a function of the person and the environment (Stern, 1964). Murray has proposed a needs-press model which allows the analogous representation of person and environment in common terms. Drawing on Murray's work, Stern (1970) has formulated a theory of person-environment congruence in which complimentary combinations of personal needs and environmental press enhance student outcomes. In a review entitled "Education's challenge to psychology: The prediction of behavior from person-environment interactions", Mitchell (1969) has stressed the critical importance of person-environment interaction for understanding and predicting human behaviour. Hunt (1975) enthusiastically recommended the study of person-environment interaction in educational psychology but admonished researchers for their apparent reluctance to incorporate a person-environment interactive perspective into their investigations.

This section reports the use of the Actual and Preferred forms of the ICEQ in exploring person-environment fit hypotheses. In particular, a description is given of a study of the effects on student learning outcomes of the degree of congruence between actual and preferred individualisation. That is, the presence of a significant actual-preferred interaction can be taken to imply that student preferences for individualisation mediate the relationships between actual individualisation and learning outcomes. The person-environment fit analyses described in this section are based on an extension of the analyses reported in the first section of this chapter involving the incremental predictive validity of student perceptions on the Actual form of the ICEQ.

Design of Study

The same sample of 285 students involved in the analyses described in the first section of this chapter was used in the study of person-environment fit. Also these analyses included the same three learning outcome posttests (two cognitive and one affective), the three corresponding pretests, the two student characteristics (general ability and sex) and the five actual individualisation variables. The distinguishing feature of the new set of analyses is that it incorporated students' perceptions of five dimensions of preferred environment as measured by the preferred form of the ICEQ. As preferred classroom environment per se was not of interest, however, data from the Actual and Preferred forms of the ICEQ were used to generate five new variables indicating the congruence between actual and preferred individualisation.

Analyses and Results

A hierarchical regression analysis was performed separately for each of the three learning outcome posttests. The first stage of each analysis simply involved entering the set of eight predictors used in the previous analyses (see Table 7). These variables were the corresponding pretest, the two

TABLE 7. Increment in Variance in each of Three Learning Outcome Posttests Associated with a Block of Five Actual-Preferred Interactions

Outcome Posttest	Percentage of Posttest Variance		
	Blocks of Predictors		
	R^2(%) for Original 8-Term Model[a]	ΔR^2(%) for 5 Actual-Preferred Interactions	ΔR^2(%) for Significant Individual Interactions
Library Usage	19.7**	4.5**	2.3** (Differ.) 1.1* (Indep.)
Charts and Tables	22.5**	5.0**	2.6** (Differ.) 1.1* (Partic.)
Enjoyment of Lessons	39.5**	0.8	

* $p<.05$, ** $p<.01$

[a] The variables in the original eight-term model were corresponding pretest, general ability, sex and the five actual individualisation variables measured by the ICEQ.

student characteristics of general ability and sex, and the five actual individualisation variables obtained from students' responses to the Actual form of the ICEQ. The second stage in each analysis involved adding to the regression equation a block of five variables representing actual-preferred congruence (or person-environment fit) on each ICEQ dimension. Person-environment fit on each dimension was defined in terms of interactions of actual and preferred variables and was obtained by taking the product of continuous scores obtained on corresponding dimensions of the Actual and Preferred forms of the ICEQ. Furthermore, the block of actual-preferred interactions was entered into the regression equations last because, on grounds of simplicity, it would be unwise to attempt to explain criterion variance in terms of actual-preferred interactions unless they account for extra variance over and above that explainable in terms of actual learning environment, student characteristics and pretest.

Table 7 shows the results obtained from the hierarchical regression analyses when the block of five actual-preferred interactions was added to the equation already containing eight variables (corresponding pretest, general ability and sex, and five actual individualisation scores). The first column of figures shows the percentage of variance in each posttest explained by the original eight-term model, while the second column shows the increment in posttest variance associated with the addition of the block of actual-preferred interactions. These results indicate that the increment in posttest variance associated with the block of actual-preferred interactions (beyond that attributable to the corresponding pretest, the two student characteristics, and the five actual individualisation variables) was 4.5 and 5.0 per cent, respectively, for the cognitive outcomes and 0.8 per cent for the affective outcome. These increments in posttest variance due to actual-preferred interactions were significant ($p < .01$) for the two cognitive criteria but nonsignificant for the affective criterion.

As the block of actual-preferred interactions was associated with a significant increment in posttest variance for both cognitive outcomes, the variance attributable to individual interactions was estimated for these two outcomes. When the variance in Library Usage posttest scores was further partitioned, it was found that the actual-preferred interaction for the Differentiation scale was associated with a significant increment of 2.3 per cent of variance beyond that attributable to pretest, student characteristics and actual individualisation variables. The actual-preferred interaction for the Independence scale was associated with a further significant increment of 1.1 per cent of variance beyond the actual-preferred interaction on the Differentiation scale. For the Charts and Tables scale, the actual-preferred interaction for the Differentiation scale was associated with a significant increment of 2.3 per cent of posttest variance beyond that attributable to pretest, student characteristics, and actual individualisation variables. The actual-preferred interaction for the Participation scale was associated with a further significant increment of 1.1 per cent of variance beyond the actual-preferred interaction for the Differentiation scale.

In order to aid interpretation of the four significant actual-preferred interactions, three-dimensional plots were sketched. In these plots, the vertical axis represented residual posttest scores which had been adjusted for all variables preceding interactions in the hierarchical regression analysis (i.e., pretest, general ability and sex, and actual individualisation variables). One horizontal axis represented continuous scores on one of the actual individualisation variables, while the other horizontal axis represented continuous scores on the corresponding preferred individualisation scale.

Inspection of these plots indicated that, in all four cases, the hypothesised person-environment interaction emerged in that the relationship between residual posttest scores and actual individualisation scores was positive for students higher in preferred individualisation but negative for students lower in preferred individualisation. For example, the interpretation

of the actual-preferred interaction for the Differentiation scale and the Library Usage outcome was that residual posttest scores increased with increasing amounts of actual classroom Differentiation for students with higher preferred Differentiation scores, but residual Library Usage scores decreased with increased actual Differentiation for students with lower preferred Differentiation scores.

Many salient features of the analyses described in this section can be summarised by examining their consistency with the following five criteria proposed as important for educational research methodology by Mitchell (1969):

1. Research problems should be conceptualised within a person-environment interactional framework.
2. Both personological and environmental domains should be conceptualised in multivariate terms which accurately reflect the complexity of these domains
3. Measures of environmental variables should be as reliable as those employed for measuring personological variables.
4. Person-environment fit should be defined in an appropriate way.
5. Multivariate statistical methods should be employed.

First the present investigation represents one of very few studies of classroom individualisation which have been conceptualised within a person-environment interaction framework. Second the personological and the environmental domain were each measured by a set of five continuous variables. This can be contrasted with the great majority of prior person-environment fit studies which have involved a single categorical personological and a single categorical environmental variable (e.g., open vs. conventional). Third the environment measures employed in the present study have been shown to be adequately reliable. Fourth person-environment fit was defined in terms of interactions between commensurate dimensions of actual individualisation and preferred individualisation. Fifth multiple regression analysis provided a powerful multivariate method of statistical analysis which enabled person-environment interactions to be represented as the products of continuous variables. In contrast, prior person-environment fit research has usually involved considerable loss of statistical power because continuous data have

been reduced to one or two levels to permit use of conventional analysis of variance routines.

Although considerable prior research has failed to establish consistent links between actual classroom individualisation and cognitive outcomes, the present investigation revealed that actual-preferred interactions accounted for appreciable amounts of learning outcome variance. That is, the present results suggest that in individualised classroom settings, a congruence between actual and preferred environment (i.e., person-environment fit) could be more important than individualisation per se. These initial findings support the potential of incorporating a person-environment interactional perspective into future investigations by considering student preferences for classroom individualisation simultaneously with actual individualisation.

CONCLUSION

This chapter has presented evidence about the predictive validity of the ICEQ based on three analyses of two data sets. These analyses all involved junior high school students in New South Wales and employed the individual as the unit of statistical analysis.

The first analysis of the first data set revealed that the five scales in the Actual form of the ICEQ together accounted for a significant increment (beyond that attributable to pretest, general ability and sex) in the variance in an affective outcome but not in two cognitive outcomes. Analyses of the second data set provided further support for the incremental predictive validity of the Actual form of the ICEQ in accounting for appreciable amounts of variance in several affective outcomes beyond that attributable to corresponding beginning-of-year attitudes. This pattern of findings is consistent with Horwitz's (1979) review of open education studies which revealed associations between classroom openness and affective but not cognitive outcomes.

Further research is needed to attempt to replicate the present findings about the predictive validity of the Student Actual form of the ICEQ. In particular, predictive validity could be explored using samples at various grade levels and in different geographic locations, and employing samples large enough to permit use of the class mean as the unit of statistical analysis. Also there is a need to conduct research into the predictive validity of the Teacher Actual form of the ICEQ.

The second analysis performed with the first data set extended prior traditions in classroom environment research by attempting to relate learning outcomes to the congruence of actual and preferred classroom environment. This person-environment fit hypothesis was premised on the intuitively plausible idea that students' preferences for individualisation could mediate relationships between learning outcomes and actual individualisation. These analyses supported the person-environment fit hypothesis in that the block of actual-preferred interactions accounted for a significant increment in the variance in two cognitive outcomes beyond that attributable to corresponding pretest, general ability, sex and actual individualisation. In all cases, relationships between learning outcomes and actual individualisation scores were positive for students higher in preferred individualisation but negative for students lower in preferred individualisation.

These preliminary findings which suggest that actual-preferred congruence is more important than the actual environment per se hold bright promise for future research programs. Further research is needed to replicate the present study and to extent it to other samples, outcomes and units of analysis. There is considerable scope also to employ a person-environment interactional framework in exploring actual-preferred interactions using Teacher forms of the ICEQ or employing classroom environment instruments other than the ICEQ.

CHAPTER 4: CRITERION VALIDITY OF ICEQ

In contrast to the previous chapters devoted to the development, validation and predictive validity of the ICEQ, this chapter dealing with the ICEQ's criterion validity describes research which was supported largely by ERDC funding. A review in Chapter 1 of some prior criterion validity research employing other classroom environment instruments has shown that student perceptions of actual classroom environment differentiated revealingly between classrooms following alternative curriculum materials or instructional methods. In the present chapter, a report is given of several studies which employed the ICEQ as a source of dependent variables and which furnish evidence about the ICEQ's criterion validity.

The criterion validity of the ICEQ is discussed in this chapter by reference to six separate analyses of several separate data sets. These analyses of data from the ICEQ provide evidence about (a) the ability of the Student and Teacher Actual forms to differentiate between classrooms following individualised and conventional curriculum materials, (b) differences between the four forms (Student Actual, Student Preferred, Teacher Actual, Teacher Preferred), (c) student perceptions of actual environment in schools implementing an innovation in individualisation, (d) changes in beginning teachers' preferences for classroom individualisation during their first year of teaching, (e) predictors of beginning teachers' preferences for classroom individualisation and (f) predictors of actual individualisation in beginning teachers' classrooms.

ACTUAL ENVIRONMENT AND USE OF INDIVIDUALISED CURRICULUM MATERIALS

Previously the Learning Environment Inventory has been used to show important differences between the perceptions of students in classrooms using conventional materials and those of students in classrooms using Harvard Project Physics materials (Anderson, Walberg and Welch, 1969) or Australian Science Education Project materials (Fraser, 1979a). An important test of the criterion validity of the Actual forms of the ICEQ would involve comparing the perceptions of teachers and/or students in classrooms following individualised curriculum materials with the perceptions of those in classrooms using conventional materials. A convenient way to attempt this test of criterion validity involved requesting teachers of the sample of 34 classes described in Chapter 2 to provide details of the curriculum materials that were being used during the time of the study. With the help of another group of teachers, it was possible to classify each of the 34 classes as either individualised or conventional depending upon the nature of the curriculum materials used. For example, science classrooms using ASEP materials and social science classrooms using SEMP materials were classified as individualised.

As data were available for both teacher and student perceptions of actual environment in each of the 34 classrooms, it was possible to investigate the criterion validity of both the Teacher Actual and the Student Actual forms of the ICEQ. The class mean was chosen as the unit of statistical analysis for those analyses involving student perceptions. Also, in order to explore whether the ICEQ's ability to differentiate between perceptions in individualised and conventional classrooms was similar for science and social science classes, it was decided also to include school subject as an independent variable in the analyses.

The first stage in the data analysis involved performing a two-way MANOVA (Clyde, 1969), with perceptions on the five scales in the Actual form of the

TABLE 8. Multivariate Tests of Significance for Subject and Curriculum Materials Differences in Perceptions of Actual Classroom Environment (Performed Separately for Teachers and Students)

Source	Teachers		Students	
	df	F	df	F
Subject x Curriculum	5, 26	0.8	5, 26	0.8
Subject (Science/social science)	5, 26	2.1	5, 26	1.3
Curriculum Materials (Individualised/conventional)	5, 26	6.5**	5, 26	2.7*

* $p<.05$, ** $p<.01$

Sample size was 34 teachers or 34 student means.

ICEQ as dependent variables and conducted separately for teacher perceptions and student class mean perceptions. The two dichotomous independent variables were the Curriculum Materials variable (individualised/conventional) and the Subject variable (science/social science)..

MANOVA results for the multivariate tests of significance for subject and curriculum materials differences in perceptions of actual classroom environment are shown separately for teachers and student class means in Table 8. This table indicates that the Subject effect and the Subject x Curriculum Materials interaction were nonsignificant ($p < .05$) for the teachers' analysis and the students' analysis. These results are important because they imply that any differences in classroom environment perceptions associated with the Curriculum Materials variable are equally applicable to science and/social science classrooms. Table 8 also shows that the multivariate test for the Curriculum Materials effect was significant for both the teachers' analysis ($p < .01$) and the students' analysis ($p < .05$).

Because the multivariate test for the set of ICEQ scales was significant for the Curriculum Materials effect, the corresponding univariate tests for individual ICEQ scales were examined. The results of univariate tests for teachers shown in Table 9 indicate that the perceptions of actual environment among teachers in classrooms following individualised materials were significantly different ($p < .05$) from those of teachers in classrooms in which conventional materials were being used for three ICEQ scales (Personalisation, Participation, Investigation). The univariate test results for students in Table 9 show that students in classrooms using individualised materials perceived their classes significantly differently ($p < .05$) from students in classes following conventional materials along the Participation and Investigation dimensions. The interpretations of the five significant relationships were that, in comparison with classrooms using conventional materials, classes following individualised curriculum materials were perceived by teachers as being characterised by greater Personalisation,

TABLE 9. Univariate Tests of Significance for Curriculum Materials Differences in Perceptions of Actual Classroom Environment (Performed Separately for Teachers and Students)

Criterion	Teachers			Students		
	MS	df	F	MS	df	F
Personalisation	134.1	1, 30	5.3*	15.8	1, 30	1.8
Participation	400.2	1, 30	29.4**	17.0	1, 30	4.3*
Independence	86.6	1, 30	2.3	2.2	1, 30	0.2
Investigation	497.4	1, 30	18.1**	21.3	1, 30	4.2*
Differentiation	26.7	1, 30	1.2	9.0	1, 30	1.2

* $p<.05$, ** $p<.01$

Sample size was 34 teachers or 34 student means.

Participation and Investigation and were perceived by students as having greater Participation and Investigation.

It is noteworthy that, in all five cases in which a significant relationship existed between the Curriculum Materials variable and scores on an ICEQ scale, ICEQ scores were higher in classrooms using individualised materials than in classrooms using conventional materials. Consequently the present findings support the criterion validity of both the Teacher Actual and the Student Actual forms of the ICEQ.

DIFFERENCES BETWEEN FOUR FORMS OF ICEQ

The fact that the ICEQ has four different forms - namely, Student Actual, Student Preferred, Teacher Actual and Teacher Preferred - permits the use of ICEQ scores as criterion variables in investigating interesting questions about whether there are differences between scores obtained on the various forms. Such an investigation would provide valuable information about differences between student and teacher perceptions of classroom environment, and about discrepancies between the environment actually present in classrooms and that preferred by students or teachers.

Differences between student and teacher perceptions of actual and preferred classroom environment were explored using data from the sample of 34 teachers and 766 junior high school students described in Chapter 2. These data were used to generate the following four sets of environment perception scores for each classroom: the teacher's actual score, the teacher's preferred score, the class mean of students' actual scores and the class mean of students' preferred scores on each of the five ICEQ scales. The means of these four sets of perception scores calculated across the 34 classrooms were then used as the basis for the construction of a simplified plot of significant differences between forms of the ICEQ.

The first stage in the construction of classroom environment profiles involved for each ICEQ scale the performance of a two-way analysis of variance with repeated measures on one factor (Winer, 1962, pp. 302-318). In these analyses, the four-level variable designating the form of the ICEQ (namely, Student Actual, Student Preferred, Teacher Actual, and Teacher Preferred) constituted the repeated measures factor. The other factor was a dichotomous variable designating whether the class being rated was either science or social science. The reason for including school subject as a factor was to explore whether different classroom environment profiles would be needed to describe science and social science classrooms. That is, results for the Subject effect provided information about differences between science and social science classes, while results for the Form x Subject interaction provided information on whether any differences existing between the four different forms of the ICEQ were comparable in science and social science classrooms.

Results of these analyses of variance shown in Table 10 indicate that the Subject effect and the Form x Subject interaction were nonsignificant for all five ICEQ scales. These results are important because they mean that the same profiles can be used legitimately to describe either science or social science classes. Results for the Form effect indicate that significant differences ($p < .05$) existed between the instruments' four forms on all scales.

TABLE 10. ANOVA Results for Form and Subject Differences in Perceptions of Classroom Environment on each ICEQ Scale

Source	df	Personalisation		Participation		Independence		Investigation		Differentiation	
		MS	F	MS	F	MS	F	MS	F	MS	F
Form (SA/SP/TA/TP)	3, 96	753.7	91.4**	283.7	36.0**	345.9	23.0**	672.8	37.9**	358.9	33.7*
Subject (Science/social science)	1, 32	25.1	0.8	1.7	0.1	28.9	0.6	107.3	3.3	103.4	3.5
Form x Subject	3, 96	11.3	1.4	3.2	0.4	2.2	0.1	5.0	0.3	17.0	1.6

* $p<.05$, ** $p<.01$

In order to interpret the significant findings for the four-level repeated measures Form factor, a series of t tests for dependent samples was used to test pairwise comparisons between the different forms. The conventional 0.05 level of confidence was adopted with these t tests because this combined the good power characteristics of individual t tests with the protection against large experimentwise Type I error afforded by the requirement that the overall F also met the 0.05 significance criterion (Cohen and Cohen, 1975, p. 162; Carmer and Swanson, 1973). Furthermore, in an attempt to provide a more parsimonious picture of differences between scores on the four forms of the ICEQ, it was decided to include only statistically significant differences ($p < .05$) when plotting the profiles shown in Figure 1. Consequently, any nonsignificant difference revealed between a pair of forms in the t tests was represented as a zero difference by averaging the relevant pair of scores.

The interpretation of the profiles shown in Figure 1 is made easier by the fact that results are identical for the four scales of Personalisation, Participation, Investigation and Differentiation. For each of these four scales, the highest scores emerged for the Teacher Preferred form, the next highest scores for the Teacher Actual and the Student Preferred form (which were not significantly different from each other) and the lowest scores for the Student Actual form. For the Independence scale, Figure 1 shows that scores on the Student Preferred form were significantly higher than scores on the other three forms, which were not significantly different from each other.

These results depicted in Figure 1 provide three fascinating general conclusions about this particular group of classrooms. First, in comparison to the emphasis they perceived as being actually present, both teachers and students tended to prefer a greater emphasis on classroom Personalisation, Participation, Investigation and Differentiation. Second,teachers tended to perceive greater actual individualisation in their classrooms (in terms of

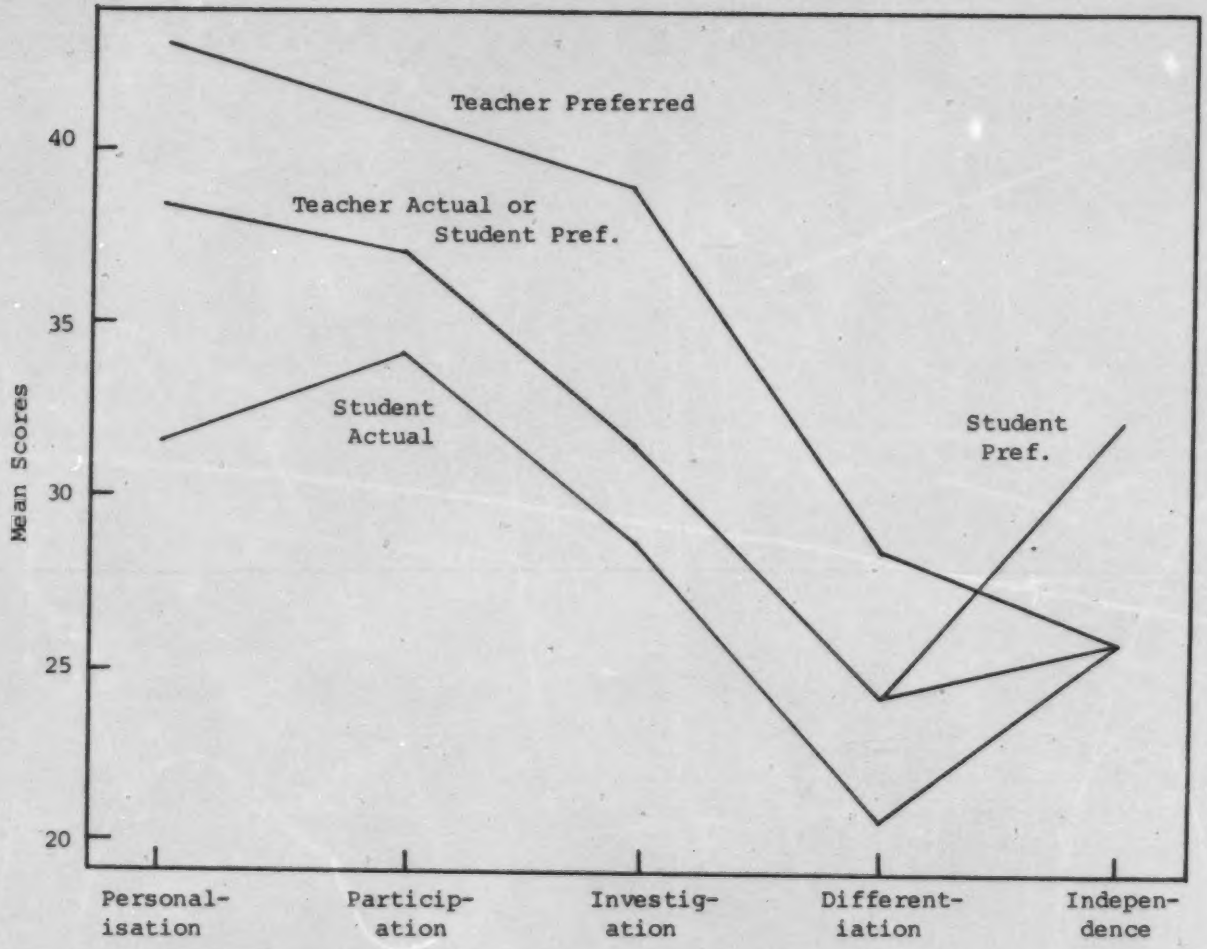

FIGURE 1. Mean Score Profiles for Four Forms of ICEQ

Personalisation, Participation, Investigation and Differentiation) than was perceived by students in the same classrooms. Third, and in contrast to the above findings, students tended to prefer greater Independence than was actually present, whereas teachers considered the actual emphasis on Independence appropriate.

It is interesting to compare the patterns of findings depicted for the ICEQ in Figure 1 with some results reported for the Classroom Environment Scale (CES). Moos (1979, ch. 7) provides one diagram comparing teachers' and students' profiles of actual environment scores in 295 U.S. classrooms and another comparing students' profiles of actual and preferred environment scores in 50 U.S. classrooms. These profiles indicate that mean actual environment scores were higher for teachers than for students on eight of the nine CES scales, and that students' preferred environment scores were higher than their actual environment scores for six of the nine CES scales. Furthermore Moos (1979, p. 149) notes that, in general, teachers' preferred environment scores on the CES also have been greater than their actual environment scores. Consequently these three findings reported by Moos for the CES are consistent with those reported here for the ICEQ in that, first, teachers' actual environment scores tended to be higher than those of their students, second, students' preferred environment scores tended to be higher than their actual environment scores and, third, teachers' preferred environment scores tended to be higher than their actual environment scores.

Notwithstanding the differences in Figure 1 in the mean scores on different forms of the ICEQ, the relative emphasis on different environment dimensions is fairly similar for the different forms as indicated by the similarity in the shape of the various profiles. For example, as seen previously in Chapter 2, the rank order correlation coefficient between Teacher Actual and Student Actual scores was 0.78 when averaged across the 34 classrooms.

STUDENT ACTUAL ENVIRONMENT AND SCHOOL INNOVATIONS IN INDIVIDUALISATION

Another potentially useful application of the ICEQ would be for monitoring school-level innovations in individualisation. At the same time, innovative school programs in individualisation provide suitable contexts for exploring the criterion validity of the Actual forms of the ICEQ.

During 1979, the Student Actual form of the ICEQ was administered in some of the classes in two open space schools which were attempting to promote individualised learning approaches. Both of these schools were in receipt of a grant from the Schools Commission Innovations Program to assist in mounting individualised approaches. One of the schools was Kelso High School, a new school near Bathurst. Unfortunately, because of staff movements among personnel assisting in data collection, complete ICEQ data are not yet available for analysis. The other school, Muirfield High School, is located in the Sydney metropolitan area. Data collected from administration of the ICEQ to some classes at this school form the basis for discussion in this section.

Muirfield High School opened in 1976 and, from its inception, emphasised individualisation and flexible use of time and space. In particular, an "Individual Progression Programme" was introduced to cater for individual differences in student learning rates and interests and to develop student capacity for self-directed work. A grant in 1978 from the Schools Commission Innovations Program for the sum of approximately $24,000 was used to support preparation of materials of stimulating format for use during periods of self-directed work.

As a major aim of the program at Muirfield High School was to develop a more individualised learning environment, student perceptions on the Actual form of the ICEQ could be used as an index of program effectiveness. Nevertheless, because no pretest ICEQ data had been collected near the

TABLE 11. Differences between Muirfield and Comparison Group Means on each Scale of Student Actual Form of ICEQ

ICEQ Scale	Means		Effect Size[a]	t
	Muirfield (N=6)	Comparison (N=34)		
Personalisation	33.1	31.5	0.6	1.5
Participation	34.8	34.1	0.3	0.8
Independence	31.3	28.4	0.8	2.1*
Investigation	19.9	20.5	-0.3	-0.7
Differentiation	28.2	25.6	1.0	2.2*

[a] Effect size is obtained by dividing the difference between means by the standard deviation for the comparison group.

* $p<.05$

beginning of the program in 1976, it was not possible meaningfully to gauge changes in classroom individualisation associated with the program's introduction. It was possible, however, to facilitate interpretation of the profile of scores obtained at Muirfield High School in 1979 by comparing it with the profile of scores obtained with the larger "comparison" sample of 34 classes described in Chapter 2.

The sample which responded to the Actual form of the ICEQ at Muirfield was the entire Year 7 group consisting of 128 students in six separate classes. Table 11 shows the mean obtained on each ICEQ scale by the sample of classes at Muirfield High School and by the comparison group of 34 classes (reported previously in Table 2). This table shows that the mean scores obtained at Muirfield High School were higher than the comparison group means on all ICEQ scales except Investigation.

The third column of figures in Table 11 shows the effect size, which is a measure of the differences between Muirfield and comparison means. The effect size is defined as the difference between means divided by the standard deviation for the comparison group using the class mean as the unit of analysis (Glass, 1977; McGaw and Glass, in press). These effect sizes indicate a relatively large difference in means for three scales. In fact, the difference between means was 0.6, 0.8 and 1.0 standard deviations for the Personalisation, Independence and Differentiation scales, respectively. The last column in Table 11 shows the results obtained when a t test for dependent samples was conducted to test the differences between means on each ICEQ scale. Although these significance tests have relatively low statistical power because of the small sample size in one group (only six classes), Muirfield means were still found to be significantly higher than comparison group means for both the Independence and the Differentiation scales.

Taken together the results in Table 11 generally show that students at a school involved in an innovation in individualisation perceived their

classes as more individualised than did comparison group students on several ICEQ dimensions. In turn, this finding provides support for the criterion validity of the Student Actual form of the ICEQ and attests to the potential usefulness of the ICEQ in monitoring school-level innovations in individualisation.

CHANGES IN BEGINNING TEACHERS' PREFERENCES FOR INDIVIDUALISATION

The Teacher preferred form of the ICEQ can be thought of as a measure of specific teacher pedagogical attitudes, namely, attitudes to or preferences for five dimensions of classroom individualisation. Consequently the Teacher Preferred form of the ICEQ is potentially useful for exploring changes in teachers' pedagogical attitudes over time (e.g., during inservice or preservice courses), or for studying correlates of teachers' pedagogical attitudes. Whereas this section describes a study of changes in teachers' preferences for individualisation, the next section is devoted to an investigation of several predictors of individualisation preferences.

A particularly interesting and important period over which to study changes in pedagogical attitudes is during the first year of teaching after preservice training. Evidence emerging from a major recent Australian study of beginning teachers (Tisher, Fyfield and Taylor, 1979) suggests that the induction process for many beginning teachers is unsatisfactory in a number of ways. Nevertheless the number of studies which has examined specific pedagogical attitudes among beginning teachers is sparse (Power, 1979), and research which examines changes in attitudes to individualisation occurring among beginning teachers is virtually nonexistent. Related research which has been conducted in Australia (e.g., Marsh, 1976) and overseas (e.g., Hoy, 1968; Jacobs, 1968), however, has revealed that beginning teachers have experienced declines in positive pedagogical attitudes, particularly those associated with classroom management and control.

The Preferred form of the ICEQ was employed in studying changes in pedagogical attitudes among the sample of 34 beginning teachers used in several analyses previously described in this report. This group initially responded to the ICEQ in 1977 as a pretest towards the end of their four years of teacher education at Macquarie University, and then again as a posttest towards the end of second term 1978 after approximately six months' experience as beginning teachers. Consequently, pretest-posttest changes on the ICEQ's Preferred form provided a measure of changes in beginning teachers' preferences for five dimensions of classroom individualisation.

Table 12 shows for each ICEQ scale the pretest mean obtained towards the end of preservice training and the posttest mean obtained after two school terms as beginning teachers. The third column of figures shows that the difference in means occurring between pretest and posttest was relatively large for two scales. In fact, the magnitude of the pretest-posttest change was 2.5 (about two thirds of a standard deviation) for the Personalisation scale and 2.9 (about half a standard deviation) for the Investigation scale. The last column of figures in Table 12 shows the results of t tests for dependent samples for changes on each ICEQ scale. These results indicate that the changes occurring in preferences on both the Personalisation and Investigation scales were statistically significant ($p < .05$).

The directions of these two significant findings suggest that beginning teachers' attitudes towards or preferences for classroom Personalisation and Investigation became more positive during the interval between the end of preservice training and the end of six months of full-time teaching. Furthermore the existence of these significant changes over time suggests the potential usefulness of the Teacher Preferred form of the ICEQ in future research into teachers' attitudes towards dimensions of classroom individualisation.

TABLE 12. Changes in Beginning Teachers' Preferences for Classroom Individualisation

ICEQ Scale	Pretest Mean	Posttest Mean	Difference	Standard Deviation of Differences	t
Personalisation	40.4	42.9	2.5	5.0	2.9**
Participation	40.1	41.1	1.0	3.8	1.5
Independence	25.9	25.6	-0.3	6.1	-0.2
Investigation	35.8	38.7	2.9	7.2	2.3*
Differentiation	28.2	28.5	0.3	5.0	0.3

* $p<.05$, ** $p<.01$

The magnitudes of the differences in means shown in Table 12 suggest that there was little consistent change in preferences experienced on several ICEQ scales by the majority of teachers. Nevertheless the magnitudes of standard deviations of teachers' pretest-posttest differences suggest that individual beginning teachers did, in fact, experience appreciable changes in preferences on ICEQ scales, although the direction of changes was not the same for all teachers. Furthermore, the fact that beginning teachers experienced changes in preferences which differed in both magnitude and sign justifies the investigation of predictors of changes in preferences described in the following section.

PREDICTORS OF BEGINNING TEACHERS' PREFERENCES FOR INDIVIDUALISATION

The previous section was devoted to a study of the changes in teacher preferences for individualisation occurring between the end of preservice training and the end of second term as beginning teachers. This section describes an investigation of factors associated with these changes in preferences. Whereas the next three subsections discuss the three classes of predictors chosen (namely, a curriculum materials variable, student preferences for individualisation and school-level environment variables), the fourth subsection reports data analyses and results.

Curriculum Materials Variable

There is some research evidence from studies of science teachers in the United States (e.g., Lazarowitz, 1976) and Australia (e.g., Fraser and Northfield, 1979) that the use of particular curriculum materials promotes changes in teachers' pedagogical attitudes. Consequently, in the present context, it is intuitively plausible that changes occurring in beginning teachers' attitudes to individualisation might be dependent upon the nature of the curriculum materials used by these teachers during their first year

of teaching. In particular, whether individualised or conventional curriculum materials are used during this time could influence preferences for classroom individualisation.

Consequently the present study included a dichotomous curriculum materials variable designating whether each of the 34 teachers used either individualised or conventional materials during the first year of teaching. This curriculum variable is identical to the variable employed in analyses described earlier in this chapter.

Student Preferences for Individualisation

Although some writers have intimated that student expectations, attitudes and preferences do influence teacher attitudes and behaviours (Ryan, 1970; Morrison and McIntyre, 1973), empirical evidence supporting this contention is scarce. Nevertheless writers such as Lortie (1969) and Lieberman and Miller (1978) have recognised that students play an important role in the process of teacher socialisation.

In the present investigation of changes in beginning teachers' preferences for individualisation, it was decided to include as predictor variables the preferences for individualisation among students taught by the teachers. As only one of the classes taught by a given beginning teacher was involved in other parts of the study (see Chapter 2), the means obtained on the Student Preferred form of the ICEQ by that class were used in the study of correlates of teachers' preferences. Consequently, as the preferences of students in all of a particular beginning teacher's classes could influence that teacher's preferences, the present analyses involving the preferences of only one class provide a conservative estimate of the importance of student preferred individualisation as a predictor variable.

School-Level Environment

It is likely that forces operating in the school environment could influence beginning teachers' pedagogical attitudes. Lacefield and Mahan (1979) contend that a teacher's attitudes are likely to change in directions which align them with the underlying values of the school and the local group norms. Kuhlman and Hoy (1974) have assumed that beginning teachers' attitudes are likely to be influenced by both formal socialisation processes (those implemented officially by the school) and informal ones (those occurring through interaction with fellow teachers). Similarly, Hannam, Smyth and Stephenson (1976) recognise that major preoccupations of the beginning teacher are relationships with teaching colleagues and the official and unofficial rules of the school. Similarly Tisher, Fyfield and Taylor's (1979) recent study of beginning teachers in Australia suggested that beginning teachers were very aware of their need for a supportive and encouraging school environment.

A review of the literature served to identify several key aspects of the school environment which are likely to affect the pedagogical attitudes and classroom practices of neophyte teachers. These include the nature of personal relationships among teachers and between teachers and students; opportunities for personal and professional development; the organisational structure (e.g., leadership, decision-making, support and propensity for change); and the goal orientation and social structure of the school. Because of the importance of these school-level environmental factors, the author and his colleague A. John Rentoul developed a new instrument, the School-Level Environment Questionnaire (SLEQ),* to facilitate assessment and study of these variables in the present investigation.

*Articles describing the development and use of the SLEQ are not yet available. Interested readers may request further information and a copy of the instrument from the author at School of Education, Macquarie University, North Ryde, N.S.W. 2113.

The development of the SLEQ was guided by the following three criteria:

1. Dimensions chosen characterised important characteristics of the school environment described in the literature (e.g., Halpin and Croft, 1963; Corwin, 1969, 1973; Gross, Giacquinta and Bernstein, 1971) and in other instruments measuring organisational climate in general, or school climate in particular (Halpin and Croft, 1963; Coughlan and Cooke, 1974; Finlayson and Deer, 1979).

2. Dimensions chosen provided coverage of the three general categories of dimensions - namely, Relationship Dimensions, Personal Development Dimensions and System Maintenance and System Change Dimensions - delineated by Moos (1974) for conceptualising human environments (see Chapter 2 for further details).

3. Dimensions chosen and individual items were considered salient and suitable by a group of educational researchers and practising teachers.

It was found that the above criteria could be satisfied with the following five scales: Affiliation, Professional Interest, Achievement Orientation, Formalisation, and Innovativeness.

An initial pool of items was written for each SLEQ scale and this was modified after receiving reactions solicited from groups of educational researchers and practising teachers. The last step involved refining scales to form a final version by application of the item analysis techniques described by Fraser (1977) to data collected from a sample of 83 teachers from 19 coeducational government schools (seven primary and 12 secondary) in the Sydney metropolitan area.

The final version of the SLEQ contains 35 items, with each of the five scales being assessed by seven items. Each item is scored on a five-point scale with the responses of Strongly Agree, Agree, Not Sure, Disagree and Strongly Disagree. The scoring direction is reversed for approximately half of the items. Table 13 further clarifies the nature of the SLEQ by showing

TABLE 13. Descriptive Information for each Scale of SLEQ

Scale Name	Moos' General Category	Description of Scale	Sample Item[a]
Affiliation	Relationship	Teachers can obtain assistance, advice and encouragement and are made to feel accepted by colleagues.	I feel that I could rely on colleagues for assistance if I should need it.
Professional Interest	Personal Development	Teachers discuss professional matters, show interest in their work and seek further professional development.	Teachers frequently discuss teaching methods and strategies with each other.
Achievement Orientation	Personal Development	Teachers value and expect high student achievement, and competition among students is encouraged.	There is a great emphasis on academic achievement at this school.
Formalisation	System Maintenance	Teachers are expected to comply with set rules, guidelines and procedures, and are supervised to ensure rule compliance.	I am often supervised to ensure that I follow directions correctly.
Innovativeness	System Maintenance	The school is in favour of planned change and experimentation, and fosters classroom openness and individualisation. Teachers try out different curriculum materials and teaching methods.	Teachers are encouraged to be innovative in this school.

[a] All items shown are scored by allocating scores of 5, 4, 3, 2 and 1, respectively, for the responses Strongly Agree, Agree, Not Sure, Disagree and Strongly Disagree. Some other items in the SLEQ are scored in the reverse manner.

TABLE 14. Alpha Reliability and Mean Correlation of a Scale with other Four Scales for each Scale of SLEQ for Validation (N=83) and Crossvalidation Sample (N=34)

Scale Name	No. of Items	Alpha Reliability		Mean Correlation with Other Scales	
		Valid.	Crossvalid.	Valid.	Crossvalid.
Affiliation	7	0.87	0.85	0.34	0.18
Professional Interest	7	0.86	0.81	0.29	0.29
Achievement Orientation	7	0.91	0.91	0.17	0.23
Formalisation	7	0.73	0.68	0.31	0.05
Innovativeness	7	0.84	0.78	0.38	0.22

the classification of each scale according to Moos' scheme and by providing a scale description and sample item for each scale.

Validation data available for the ICEQ include information about each scale's internal consistency (Cronbach alpha reliability coefficient) and discriminant validity (mean correlation with the other four scales). Table 14 shows the values obtained for the alpha coefficient and the mean correlation with the other scales both for the validation sample of 83 teachers and for a crossvalidation sample consisting of the 34 beginning teachers used throughout this report. These data suggest that all SLEQ scales have acceptable internal consistency and discriminant validity.

Analyses and Results

The basic design of this study involved the prediction of beginning teachers' preferences for classroom individualisation from a set of eight predictor variables. The five criterion variables consisted of scores obtained on the Teacher Preferred form of the ICEQ by the sample of 34 beginning teachers after they had been teaching in their schools for approximately six months. A separate analysis was performed for each of the five criterion variables using the following eight predictor variables:

- scores on the corresponding Teacher Preferred ICEQ scale at pretesting late in 1977 towards the end of preservice training
- class mean scores on the corresponding Student Preferred ICEQ scale
- curriculum materials variable (defined in terms of usage of either individualised or conventional materials)
- the five dimensions of school environment measured by the SLEQ.

Multiple regression techniques were chosen for analysing the present data for the same reasons that were outlined in Chapter 3 in relation to predictive validity studies. In particular, it was desirable to test the combined effect of the block of five school environment variables prior to examining individual school environment predictors. Although the conventional 0.05 level of confidence was chosen for the majority of tests, it was decided

to adopt the 0.1 level of confidence as the condition to be applied to the block of school environment dimensions. That is, tests for individual SLEQ scales were performed only if the block of five SLEQ scales accounted for a significant amount of variance at the 0.1 level. This approach provided reasonable protection against Type I errors while maintaining an adequate level of statistical power for the present relatively small sample size (N=34).

In the predictive validity studies reported in Chapter 3, the grounds for an a priori ordering of predictor variables were sufficiently strong to permit the use of the hierarchical regression approach. In the present analyses, pretest scores on the corresponding Teacher Preferred scale were entered first into the regression equation prior to the other predictors because this permitted exploration of predictors of the "changes" occurring in teachers' preferences during the time of transition from student teacher to beginning teacher (see Cohen and Cohen, 1975). As there were no strong grounds for an a priori ordering of the other predictors (i.e., corresponding Student Preferred scale, curriculum materials variable and block of school environment variables), these variables were entered simultaneously into the regression equation to provide the most conservative tests of relationships. That is, the effect of each of these predictors was estimated in terms of an increment in criterion variance beyond that attributable to all other predictors (including Teacher Preferred pretest).

Table 15 shows the results of these multiple regression analyses. The first column of figures shows that the full eight-term model accounted for between 31.7 and 50.4 per cent of the variance in scores on different preferred individualisation scales. A significant relationship ($p < .05$) existed between the set of eight predictors and three ICEQ scales, namely, Participation, Independence and Differentiation. The second column of figures shows that scores on the corresponding Teacher Preferred scale accounted for a significant contribution to criterion variance of 27.0 per cent for the Participation scale, 15.2 per cent for the Independence scale and 19.1 per cent

TABLE 15. Percentage of Variance in Five Teacher Preferred Individualisation Scales Accounted for by Corresponding Teacher Preferred Individualisation Pretest, Corresponding Student Preferred Individualisation Scale, Curriculum Materials Variable and Five School Environment Variables

Teacher Preferred Individualisation Scale	Percentage of Variance					
	R(%) for Full 8-Term Model	R^2(%) for Corres. Teacher Prefer. Pretest	Unique ΔR^2(%) Beyond Teacher Preferred Pretest			Unique ΔR(%) for Significant Individual Predictors
			Corres. Student Prefer. Scale	Curriculum Materials Variable	Block of 5 School Environment Variables	
Personalisation	31.7	10.5	0.9	5.8	10.7	
Participation	45.4*	H 27.0*	2.9	2.3	7.5	
Independence	49.2*	H 15.2*	5.2	0.2	30.3*	L 11.1* (Form.) L 10.1* (Innov.)
Investigation	32.9	2.5	H 12.8*	0.3	16.0	
Differentiation	50.4*	H 19.1**	9.4	0.4	22.0 (.1)	L 10.1* (Form.)

(.1) $p<.1$, * $p<.05$, ** $p<.01$

H Higher scores on predictor variable were associated with higher teacher preferred individualisation scores.

L Lower scores on school environment scale were associated with higher teacher preferred individualisation scores.

for the Differentiation scale. In each of these three cases, a positive relationship existed between Teacher Preferred scores at pretesting and posttesting.

The third column of Table 15 shows that scores on the corresponding Student Preferred scale accounted for between 0.9 and 12.8 per cent of the variance in Teacher Preferred posttest scores beyond that attributable to Teacher Preferred pretest scores, the curriculum variable and the block of school environment scales. This increment was significant ($p < .05$) only for the Investigation scale, and the interpretation of this result was that a positive relationship existed between Teacher Preferred Investigation scores and Student Preferred Investigation scores. The fourth column of figures in the table indicates that the curriculum variable accounted for a nonsignificant increment (beyond that attributable to the other seven predictors) in the variance of Teacher Preferred individualisation scores of between 0.2 and 5.8 per cent for different ICEQ scales.

The fifth column in Table 15 shows that the block of five school environment variables accounted for an increment of between 7.5 and 30.3 per cent of the variance in Teacher Preferred individualisation scales (beyond that attributable to Teacher Preferred pretest, Student Preferred scores and curriculum materials). These increments were significant for two scales, namely, Independence ($p < .05$) and Differentiation ($p < .1$). When the variance attributable to the block of SLEQ scales was further partitioned for the Independence scale, it was found that the Formalisation scale accounted for a significant increment of 11.1 per cent in criterion variance (beyond Teacher Preferred pretest, Student Preferred scores and curriculum materials). The Innovativeness scale accounted for a further significant increment of 10.1 per cent in the variance of Preferred Independence scores. For the Differentiation scale, it was found that the Formalisation scale accounted for an increment of 10.1 per cent of criterion

variance (beyond Teacher Preferred pretest, Student Preferred scores and curriculum materials).

The interpretations of the three significant findings for individual school environment variables were that teachers with preferences for greater classroom Independence were found in schools with less Formalisation and Innovativeness, while teachers with preferences for greater classroom Differentiation were found in schools with less Formalisation. Certainly it is intuitively plausible that greater school Formalisation could promote in beginning teachers a less positive attitude towards dimensions of classroom individualisation such as Independence or Differentiation. Although there is some implausibility in the finding that greater Innovativeness in the school environment was linked with preferences for less classroom Independence, it is possible that the student control problems which can accompany school Innovativeness could lead to a less positive attitude towards catering for student Independence in the classroom. Caution should be exercised in placing too much weight on the findings for individual school environment variables, however, until the present research has been replicated.

While the tentativeness of results in this section must be acknowledged, analyses have revealed a number of fascinating findings about factors associated with beginning teachers' attitudes towards classroom individualisation. In particular, it was found that student preferences for classroom individualisation and the level of Formalisation and Innovativeness in the school environment were linked with beginning teachers' preferences for certain dimensions of individualisation. In turn, the existence of these relationships supports the usefulness of the Teacher Preferred form of the ICEQ as a source of criterion variables in studies of predictors of teachers' pedagogical attitudes.

PREDICTORS OF ACTUAL INDIVIDUALISATION IN BEGINNING TEACHERS' CLASSROOMS

The previous section described a study of predictors of beginning teachers' preferences for classroom individualisation as measured by the Teacher Preferred form of the ICEQ. In contrast, this section describes a study which employs a very similar set of predictor variables together with the Teacher Actual form of the ICEQ in investigating factors associated with levels of actual individualisation in beginning teachers' classrooms. The next two subsections briefly describe the predictor variables used, while the third subsection reports analyses and results.

Preferred Individualisation

According to Power (1977), teachers' beliefs about (or attitudes to or preferences for) classroom practices have a powerful influence on their actual classroom behaviour. In particular, an important Australian study of associations between teachers' values about teaching and their classroom interaction patterns revealed that teachers tended to foster classroom environment characteristics which were in accord with their own pedagogical beliefs and preferences (Tisher and Power, 1975). Consequently, the present study of actual classroom individualisation included among the predictor variables teachers' preferences for classroom individualisation as measured by the Teacher Preferred form of the ICEQ.

Curriculum Materials, Student Preferences and School-Level Environment

In the previous section on beginning teachers' preferences for individualisation, predictors included a curriculum materials variable, student preferences for classroom individualisation and five school-level environment dimensions. The literature can be used to justify the inclusion of these same variables as predictors in the present analyses involving actual classroom individualisation as criterion. The inclusion of the

curriculum materials variable can be justified in terms of prior research which has shown that student perceptions of actual classroom environment have differentiated revealingly between classrooms following alternative curriculum materials (Anderson, Walberg and Welch, 1969; Cort, 1979; Fraser, 1979a; Levin, 1980). Incorporating student preferences as predictors of actual classroom environment can be justified in terms of various theoretical positions such as Haller's (1967) view that students shape teacher behaviour through the mechanism of operant conditioning or Turner's (1967) model linking student characteristics to teachers' behaviour. The literature also suggests that factors in the school environment (e.g., relationships with colleagues, the official and unofficial rules of the school) are likely to be powerful forces which affect the beginning teachers' practices and classroom environment (Hannam, Smyth and Stephenson, 1976; Lacefield and Mahan, 1979; Tisher, Fyfield and Taylor, 1979). In particular, Willower and Jones (1963) claim that beginning teachers feel restricted in the kinds of classroom innovations they can employ because more open methods leave them open to the charge of softness.

The variables of curriculum materials, student preferences and school-level environment were measured in the present analyses in the same way as in the study described in the previous section. That is, the curriculum materials variable was a dichotomous variable designating whether individualised or conventional materials were being used, student preferences were measured by class mean scores on the Student Preferred form of the ICEQ, and school environment was measured using the five scales of the SLEQ.

Analyses and Results

The basic design of the present study of predictors of actual classroom individualisation was very similar to that of the study of predictors of preferred individualisation described in the previous section. Scores obtained by the group of 34 beginning teachers and their students at the

end of second term 1978 provided the data for the analyses. Whereas scores on the Teacher Preferred form of the ICEQ provided the criterion variables in the previous analyses, the present study employed scores on the Teacher Actual form of the ICEQ as criterion variables. In the previous analyses, pretest scores obtained in 1977 on the corresponding Teacher Preferred scale were entered first in each regression equation. Analogously in the present analyses, scores obtained in 1978 on the corresponding Teacher Preferred scale were entered first into the regression equations. As in the previous analyses, the same set of seven predictor variables - namely, the corresponding Student Preferred ICEQ scale, the curriculum materials variable and the five school environment scales - were entered simultaneously into each regression equation after the variance attributable to corresponding Teacher Preferred scores had been removed. As before, tests for individual SLEQ scales were performed only if the block of five SLEQ scales accounted for a significant increment in criterion variance at the 0.1 level of confidence.

In summary, a separate multiple regression analysis was conducted for each of the five Teacher Actual ICEQ scales using the following eight predictor variables:

. scores on the corresponding Teacher Preferred ICEQ scale

. class mean scores on the corresponding Student Preferred ICEQ scale

. curriculum materials variable (individualised/conventional)

. the five school environment variables measured by the SLEQ.

Table 16 contains the results of the five separate regression analyses. The first column of figures shows that the full eight-term model accounted for a significant contribution ($p < .05$) of between 48.6 and 78.3 per cent to the variance in Teacher Actual individualisation scales. The second column shows that scores on the corresponding Teacher Preferred individualisatio scale accounted for a significant contribution ($p < .05$) to Teacher Actual individualisation scores of 17.8 per cent for the Personalisation scale, 27.7 per cent for the Participation scale, 63.3 per cent for the Independence

TABLE 16. Percentage of Variance in Five Teacher Actual Individualisation Scales Accounted for by Corresponding Teacher Preferred Individualisation Scale, Corresponding Student Preferred Individualisation Scale, Curriculum Materials Variable and Five School Environment Variables

Teacher Actual Individualisation Scale	Percentage of Variance					
	R(%) for Full 8-Term Model	R^2(%) for Corres. Teacher Pref. Scale	Unique ΔR^2(%) Beyond Teacher Preferred Scale			Unique ΔR(%) for Significant Individual Predictors
			Corres. Student Prefer. Scale	Curriculum Materials Variable	Block of 5 School Environment Variables	
Personalisation	50.9*	H 17.8*	1.7	1.3	25.1*	H 12.1* (Affil.) H 8.9* (Innov.)
Participation	66.8**	H 27.7**	1.2	I 24.1**	8.3	
Independence	78.3**	H 63.3**	0.8	I 4.5*	9.1 (.1)	H 3.8* (Prof. Int.)
Investigation	59.6**	0.8	2.1	I 15.5**	17.7 (.1)	H 9.9* (Ach. Or.)
Differentiation	48.6*	H 39.7**	0.5	3.8	3.8	

(.1) $p<.01$, * $p<.05$, ** $p<.01$

H Higher scores on the predictor variable were associated with higher teacher actual individualisation scores.

I Individualised curriculum materials were associated with higher teacher actual individualisation scores.

scale and 39.7 per cent for the Differentiation scale. In all cases, a positive relationship existed between scores on Teacher Actual and Preferred scales.

The third column in Table 16 indicates that scores on the corresponding Student Preferred scale accounted for a nonsignificant increment of between 0.5 and 2.1 per cent of the variance in a Teacher Actual ICEQ scale (beyond Teacher Preferred scores, curriculum materials and school environment). The fourth column shows that the curriculum materials variable accounted for a significant increment ($p < .05$) in variance (beyond Teacher Preferred scores, Student Preferred scores and school environment variables) of 24.1 per cent for the Participation scale, 4.5 per cent for the Independence scale and 15.5 per cent for the Investigation scale. In each of these three cases, teachers in classrooms using individualised curriculum materials perceived greater Actual classroom individualisation than teachers in classrooms following conventional materials.

The fifth column of results in Table 16 indicates that the increment in criterion variance explained by the block of school environment variables (beyond the three variables of Teacher Preferred individualisation, Student Preferred individualisation and curriculum materials) ranged from 3.8 to 25.1 per cent for different Teacher Actual ICEQ scales. This increment was significant ($p < .1$) for the Personalisation, Independence and Investigation scales. Further partitioning of the variance associated with the block of SLEQ scales for the Personalisation, Independence and Investigation scales revealed four cases in which an individual SLEQ dimension accounted for a significant increment in criterion variance. Scores on the Affiliation scale accounted for a significant increment of 12.1 per cent of the variance in Actual Personalisation scores beyond the three preceding predictors. Scores on the Innovativeness scale accounted for a further 8.9 per cent of the variance of Actual Personalisation scores. Professional Interest scores accounted for a significant increment of 3.8 per cent in the variance of

Actual Independence scores, while Achievement Orientation accounted for an increment of 9.9 per cent in the variance of Actual Investigation scores (beyond the preceding three predictors in each case). An examination of the directions of these four relationships indicated that greater Affiliation and Innovativeness in the school environment was associated with greater classroom Personalisation, greater school Professional Interest was associated with greater classroom Independence and greater school Achievement Orientation was associated with more classroom Investigation.

The set of analyses described in this section yielded numerous significant findings of interest. Scores on an actual classroom individualisation scale were found to be significantly related to scores on the corresponding Teacher Preferred scale for four ICEQ scales, but to be related to scores on the corresponding Student Preferred scale in no cases. Classes using conventional curriculum materials, in comparison with those using conventional materials, were found to have greater actual classroom Participation, Independence and Investigation. Results for individual school environment predictors also yielded a further four significant findings. Greater classroom Personalisation was found in schools with greater Affiliation and Innovativeness, greater classroom Independence was found in schools with more Professional Interest, and more classroom Investigation was found in schools with greater Achievement Orientation.

Because of the exploratory and tentative nature of the present findings, it would be imprudent to attempt a more confident interpretation of findings for individual school environment variables without evidence from replication studies. Nevertheless the present study, which is one of the first to explore relationships between school-level and classroom-level environment, has established some fascinating but tentative patterns of findings. While there is considerable scope for further research in this area, the results available to date attest to the usefulness of the ICEQ as a source of criterion variables in studies of predictors of actual classroom environment.

CONCLUSION

This chapter reported six sets of analyses in which scores on various forms of the ICEQ were used as dependent variables and which furnished evidence about the ICEQ's criterion validity. The main findings of these analyses are summarised below:

1. The fact that scores on several scales in the Actual forms of the ICEQ were found to be significantly higher in classrooms using individualised curriculum materials than in classrooms following conventional materials supported the criterion validity of the ICEQ's Actual forms.

2. A comparison of scores obtained on the four forms of the ICEQ by the same sample of classes revealed that, first, both teachers and students tended to prefer greater emphasis on dimensions of classroom individualisation than they perceived as being actually present and, second, teachers tended to perceive greater actual individualisation in their classrooms than was perceived by students in the same classrooms.

3. The finding that students in a school implementing an innovation in individualisation perceived their classes as more individualised than did a comparison group supported the criterion validity of the ICEQ's Student Actual form and its usefulness in monitoring school innovations in individualisation.

4. The finding that beginning teachers' preferences for two dimensions of classroom individualisation became significantly more positive during the first year of teaching attested to the potential usefulness of the ICEQ's Teacher Preferred form in research into teachers' pedagogical attitudes.

5. A study of predictors of beginning teachers' preferences for classroom individualisation revealed that student preferences for classroom individualisation and psychosocial characteristics of the school-level

environment (namely, Formalisation and Innovativeness) were linked with teacher attitudes as measured by the ICEQ's Teacher Preferred form.

6. A study of predictors of beginning teachers' actual classroom individualisation revealed that a curriculum materials variable (individualised/conventional) and psychosocial characteristics of the school-level environment (namely, Affiliation, Professional Interest, Achievement Orientation and Innovativeness) were linked with actual classroom individualisation as measured by the ICEQ's Teacher Actual form.

Taken together evidence accruing from the series of six data analyses provides considerable support for the criterion validity of the ICEQ and for its potential usefulness as a source of dependent variables in a variety of research contexts. In particular, evidence reported in this chapter suggests the usefulness of the Actual form of the ICEQ as a source of criterion variables in the evaluation of individualised curriculum materials or school programs. Also the Teacher Preferred form of the ICEQ was found to be useful in studies of changes in and predictors of teachers' attitudes to or preferences for dimensions of classroom individualisation. Similarly the Teacher Actual form of the ICEQ proved to be useful in a study of predictors of levels of actual individualisation present in classrooms.

Although caution is needed before placing too much weight on findings from the series of initial investigations reported here, the results which have emerged are sufficiently interesting to justify other workers' attempts to replicate and extend the research. Certainly there is considerable scope to employ the Actual forms of the ICEQ as criteria when evaluating innovations in classroom individualisation and to use the Teacher Preferred form of the ICEQ in evaluating preservice or inservice courses aimed at promoting positive attitudes towards classroom individualisation. Moreover the present research which attempted to establish links between school-level environment and either actual or preferred classroom-level environment provides a new and potentially fruitful direction for future research.

CHAPTER 5: CONCLUSION

During the 1960's and 1970's, a remarkable amount of research activity focussed on the use of perceptual measures of psychosocial characteristics of classroom learning environments. This prior research was reviewed briefly in Chapter 1. Over the past few years the author has been engaged in a program of research, funded partly by ERDC, which was consistent with prior traditions in classroom environment research. But this research program also broke new ground because it involved the development, validation and use of a new instrument, the Individualised Classroom Environment Questionnaire (ICEQ), which measures important dimensions neglected in other widely used questionnaires. These dimensions, which are called Personalisation, Participation, Independence, Investigation and Differentiation, distinguish individualised and conventional classroom settings. The purpose of this concluding chapter is to summarise salient aspects of previous chapters and to suggest desirable directions for future research.

Whereas most prior classroom environment research has restricted its attention to student perceptions of actual environment, the ICEQ is designed to provide a basis for an extension of this tradition to incorporate also the study of student perceptions of preferred environment, teacher perceptions of actual environment and teacher perceptions of preferred environment. One advantage of having the four different forms of the ICEQ is that it permits investigation of differences in student and teacher perceptions of the same classroom and differences between perceptions of actual and preferred environment. Another merit in having actual and preferred forms is that it allows investigation of whether the relationship between student

learning outcomes and actual classroom individualisation is mediated by student preferences for individualisation.

Although only the research into the criterion validity of the ICEQ was funded by ERDC, a decision was made also to include in this report all prior work related to the development, validation and predictive validity of the ICEQ. The major purpose for doing this is to make past work involving the ICEQ available to wider audiences, and to encourage and help other workers who might profitably incorporate the ICEQ into their own research. Also, to facilitate others' use of the ICEQ, Appendix A contains a complete copy of the instrument together with scoring instructions.

Chapter 2 was devoted to outlining the initial development of the ICEQ, describing its nature and reporting data relevant to its validity. In particular, data were presented to support the internal consistency and discriminant validity of the Student Actual and Preferred forms (using either the individual or the class mean as the unit of analysis) and of the Teacher Actual and Preferred forms. Other data attested to the Student Actual form's test-retest reliability and ability to differentiate between classrooms, and revealed sizable positive associations between teacher and student perceptions of the actual environment of the same classrooms.

When classroom environment characteristics are employed as independent variables, research results yield information about the predictive validity of environmental perceptions in accounting for variance in student learning outcomes (often beyond that attributable to student characteristics such as pretest performance or general ability). In fact, evidence accrued from a large number and variety of past predictive validity studies reviewed in Chapter 1 indicates that classroom environment variables account for appreciable proportions of the variance in student cognitive and affective outcomes.

Chapter 3 reported information about the predictive validity of student perceptions on the Actual form of the ICEQ based upon three analyses of two data sets obtained from junior high school classes. The first analysis of the first data set showed that student perceptions on the five ICEQ scales together accounted for a significant increment in the variance in an affective outcome but not in two cognitive outcomes (beyond that attributable to parallel pretest, general ability and sex). Analyses performed using the second data set added support for the predictive validity of the ICEQ in accounting for the variance in several different attitudinal outcomes beyond that attributable to corresponding beginning-of-year attitudes.

There is considerable scope to replicate and extend the studies reported in Chapter 3 of the predictive validity of student perceptions of actual classroom environment. In particular, there is a need to explore the predictive validity at the Student form of the ICEQ for samples at various grade levels and in various geographic locations and using a variety of learning outcome measures. Furthermore, as no research has been conducted so far into the predictive validity of the Teacher Actual form of the ICEQ, it is desirable that future research efforts are devoted to exploring associations between teacher perceptions of actual classroom environment and either student learning outcomes or teacher outcomes (e.g., job satisfaction).

Prior predictive validity research has usually employed either the individual student or the class mean as the unit of analysis. Nevertheless a small number of studies has employed other units such as the school mean (Perkins, 1978), the mean of subgroups of students within the class (Walberg, Singh and Rasher, 1977) or the student's deviation from his own class mean (Keeves and Lewis, 1979; Sirotnik, 1979). Another approach is to employ the student as the unit of analysis but to use the Jacknife technique to adjust regression weights and significance levels to allow for nonindependence

of observations (see Marjoribanks, 1980). The choice of data analytic unit is of key importance because classroom environment scales may have different substantive interpretations with different units and because the magnitudes of relationships between environment and other variables could differ with the choice of units of analysis. In the predictive validity studies reported in Chapter 3, the individual student was employed as the unit of statistical analysis. It is desirable that future research involving the use of the ICEQ involves samples sufficiently large to permit exploration of the effect that adopting different units of analysis has on the results of studies.

Chapter 3 also reported analyses of Actual and Preferred scores which represented a confluence of two previously distinct research traditions, namely, person-environment fit and classroom environment research. In particular, relationships between learning outcomes and actual-preferred interactions were investigated to test whether students' preferences for individualisation mediated relationships between learning outcomes and actual individualisation. The person-environment fit hypothesis was supported by several significant findings indicating that the relationship between learning outcomes and actual individualisation tended to be positive for students higher in preferred individualisation but negative for students lower in preferred individualisation. This pattern of fascinating but tentative findings suggests that actual-preferred congruence could be more important than individualisation per se in predicting student cognitive achievement.

It is highly desirable that future classroom environment research employs a person-environment interactional framework and attempts to replicate and extend the promising research done so far. Further studies are needed to explore whether the existence of sizable actual-preferred interactions are replicated when the Student forms of the ICEQ are used with other samples.

There is scope also to explore whether actual-preferred interactions between scores on the Teacher forms of the ICEQ are predictive of student or teacher outcomes. Finally, use of actual and preferred forms of other classroom environment scales (e.g., the LEI or CES) in exploring person-environment fit hypotheses is highly encouraged.

A review of prior criterion validity studies reveals that classroom environment variables have proved useful in curriculum evaluation studies because environmental perceptions differentiated revealingly between classrooms following alternative curricula (see Chapter 1). In Chapter 4, a description was given of numerous studies which employed ICEQ scores as dependent variables and which furnished evidence about the ICEQ's criterion validity.

Two of the analyses in Chapter 4 explored the criterion validity of the Actual forms of the ICEQ. The first of these involved comparison of classes using individualised curriculum materials with classes using conventional materials in terms of student and teacher perceptions of actual environment. The second analysis examined differences between classes in a school implementing an innovation in individualisation and a comparison group of classes. Together these analyses revealed numerous significant differences, and the direction of these differences in all cases supported the criterion validity of the Actual forms of the ICEQ.

An investigation of differences on the four forms of the ICEQ for a sample of teachers and their students provided two fascinating patterns of results. First, in comparison to the emphasis they perceived as being actually present, both teachers and students tended to prefer greater classroom individualisation. Second, teachers tended to perceive greater actual individualisation in their classrooms than did students in the same classrooms.

Other criterion validity analyses involved the use of the Teacher Preferred form of the ICEQ in examining changes in and predictors of teachers' attitudes to classroom individualisation. Beginning teachers' preferences for two dimensions of individualisation were found to become more positive during the interval between the end of preservice education and the end of two school terms as full-time teachers. Also it was found that beginning teachers' preferences for certain dimensions of classroom individualisation were linked with student preferences for classroom individualisation and psychosocial characteristics of the school-level environment (particularly Formalisation and Innovativeness). Consequently this research attested to the potential usefulness of the Teacher Preferred form of the ICEQ in future research into teachers' attitudes towards classroom individualisation.

The final criterion validity analyses involved exploring predictors of beginning teachers' actual classroom environment as measured by the Teacher Actual form of the ICEQ. It was found that the level of actual individualisatio was linked with the choice of curriculum materials (individualised or conventional) and psychosocial aspects of the school-level environment. For example, greater classroom Personalisation was found in schools with greater Affiliation and Innovativeness.

Although this set of studies provided much support for the criterion validity of the ICEQ, it is highly desirable that the ICEQ be used as a source of criterion variable in further research. In particular, the Actual forms could be employed fruitfully as a source of criteria of effectiveness in the evaluation of innovations in classroom individualisation, while the Teacher Preferred form could be used in studies of changes in and predictors of teachers' attitudes to classroom individualisation.

Although Tisher, Fyfield and Taylor's (1979) study of Australian beginning teachers did not set out specifically to relate the effects of school climate on beginning teachers, the experience gained during the study led

them to conclude that the nature of the school environment does have an important influence on the beginning teacher's induction. The present studies of the criterion validity of the Teacher forms of the ICEQ also have revealed some promising but tentative links between psychosocial aspects of the school environment and beginning teachers' pedagogical attitudes and actual classroom environment. In fact the research described in this report represents one of the few attempts to explore associations between school-level and classroom-level environment. Consequently it is highly desirable that the ICEQ is used in future research which explores relationships between school-level environment and either actual or preferred classroom-level environment.

It is also desirable that the recent emphasis on classroom environment research should have some practical applications in facilitating environmental change in classrooms. Having Actual and Preferred forms of the ICEQ makes it possible to use data on actual-preferred discrepancies as a practical basis for planning environmental changes which align the actual environment with students' or teachers' preferred environment. Although educators generally have paid surprisingly little attention to this potentially promising idea, Fraser (1980a, ch. 5) illustrates various ways that data collected using the Actual and Preferred forms of the ICEQ can be processed to form profiles useful in guiding systematic attempts to improve classroom environments.

APPENDIX A: ICEQ ITEMS AND DIRECTIONS FOR ANSWERING AND SCORING

This appendix contains a copy of the following:

1. Student Actual form of ICEQ (first two pages)
2. Instructions for answering Student Preferred, Teacher Actual and Teacher Preferred forms of ICEQ (third page)
3. Response Sheet for Student Actual form of ICEQ (fourth page)
4. Scale allocation and scoring directions for each item in ICEQ (fifth page)

INDIVIDUALISED CLASSROOM ENVIRONMENT QUESTIONNAIRE (ICEQ)

STUDENT ACTUAL FORM

DIRECTIONS

1. This questionnaire contains statements about practices which could take place in your ..... classroom. You will be asked how often each practice actually takes place in your ..... classroom.

2. There are no 'right' or 'wrong' answers. Your opinion is what is wanted.

3. Please do not write on this test. All answers should be written on your Response Sheet.

4. Think about how well each statement describes your ..... classroom. On your Response Sheet draw a circle around

1	if the practice takes place	ALMOST NEVER
2	if the practice takes place	SELDOM
3	if the practice takes place	SOMETIMES
4	if the practice takes place	OFTEN
5	if the practice takes place	VERY OFTEN

5. Be sure to give an answer for all questions. If you change your mind about an answer, just cross it out and circle another.

1. The teacher talks with each student.
2. All students in the class use the same textbooks.
3. Students find out the answers to questions from textbooks rather than from investigations.
4. The teacher talks rather than listens.
5. The teacher decides where students sit.
6. Students discuss their work in class.
7. Students work at their own speed.
8. Students draw conclusions from information.
9. The teacher takes a personal interest in each student.
10. The teacher goes out of his way to help each student.
11. Students choose their partners for group work.
12. All students in the class do the same work at the same time.
13. Students carry out investigations to test ideas.
14. Most students take part in discussions.
15. The teacher is unfriendly to students.
16. Different students do different work.
17. Students find out the answers to questions and problems from the teacher rather than from investigations.
18. Students give their opinions during discussions.
19. Different students use different tests.
20. Students are asked to think about the evidence behind statements.

Further information about this questionnaire can be obtained from A. Rentoul and B. Fraser, Macquarie University.

(Remember you are rating <u>actual</u> classroom practices)

21. The teacher lectures without students asking or answering questions.

22. Students are told exactly how to do their work.

23. The teacher helps each student who is having trouble with his work.

24. Students who have finished their work wait for the others to catch up.

25. Students are told how to behave in the classroom.

26. The teacher remains at the front of the class rather than moving about and talking with students.

27. Students carry out investigations to answer questions coming from class discussions.

28. The teacher decides when students are to be tested.

29. Students are punished if they behave badly in class.

30. Different students use different books, equipment and materials.

31. Students explain the meaning of statements, diagrams and graphs.

32. Students are asked questions.

33. The teacher decides which students should work together.

34. Students are told what will happen if they break any rules.

35. The teacher considers students' feelings.

36. Students who work faster than others move on to the next topic.

37. Students carry out investigations to answer questions which puzzle them.

38. Students sit and listen to the teacher.

39. Students are encouraged to be considerate of other people's ideas and feelings.

40. The same teaching aid (e.g., blackboard or overhead projector) is used for all students in the class.

41. Investigations are used to answer the teacher's questions.

42. Students' ideas and suggestions are used during classroom discussion.

43. Students who break the rules get into trouble.

44. The teacher tries to find out what each student wants to learn about.

45. Students ask the teacher questions.

46. The teacher uses tests to find out where each student needs help.

47. All students are expected to do the same amount of work in a lesson.

48. Students solve problems by obtaining information from the library.

49. There is classroom discussion.

50. The teacher decides how much movement and talk there should be in the classroom.

Directions for Student Preferred Form

1. This questionnaire contains statements about practices which could take place in your ..... classroom. You will be asked how often you would like or prefer each practice to take place in your ..... classroom.

2. There are no 'right' or 'wrong' answers. Your opinion is what is wanted.

3. Please do not write on this questionnaire. All answers should be written on your Response Sheet.

4. Think about how well each statement describes your ..... classroom. On your Response Sheet draw a circle around

1	if you would prefer the practice to take place	ALMOST NEVER
2	if you would prefer the practice to take place	SELDOM
3	if you would prefer the practice to take place	SOMETIMES
4	if you would prefer the practice to take place	OFTEN
5	if you would prefer the practice to take place	VERY OFTEN

5. Be sure to give an answer for all questions. If you change your mind about an answer, just cross it out and circle another.

Directions for Teacher Actual Form

This questionnaire is designed to obtain information about classroom practices which actually take place in your classroom.

Consider how often the teaching practice described in each of the following statements actually takes place in your classroom.

Indicate your response by circling the number on your Response Sheet corresponding to your chosen response.

Directions for Teacher Preferred Form

This questionnaire is designed to obtain information about your preferences for different classroom practices.

Consider how often you would like or prefer the teaching practice described in each of the following statements to take place in your classroom.

Indicate your response by circling the number on your Response Sheet corresponding to your chosen response.

INDIVIDUALISED CLASSROOM ENVIRONMENT QUESTIONNAIRE (ICEQ)

RESPONSE SHEET

NAME: _____ CLASS: _____ BOY/GIRL: _____
(BLOCK LETTERS)

PART A - ACTUAL CLASSROOM PRACTICES

PAGE 1

	Almost never	Seldom	Some-times	Often	Very often		Almost never	Seldom	Some-times	Often	Very often
1.	1	2	3	4	5	11.	1	2	3	4	5
2.	1	2	3	4	5	12.	1	2	3	4	5
3.	1	2	3	4	5	13.	1	2	3	4	5
4.	1	2	3	4	5	14.	1	2	3	4	5
5.	1	2	3	4	5	15.	1	2	3	4	5
6.	1	2	3	4	5	16.	1	2	3	4	5
7.	1	2	3	4	5	17.	1	2	3	4	5
8.	1	2	3	4	5	18.	1	2	3	4	5
9.	1	2	3	4	5	19.	1	2	3	4	5
10.	1	2	3	4	5	20.	1	2	3	4	5

(Remember you are rating actual classroom practices)

PAGE 2

	Almost never	Seldom	Some-times	Often	Very often		Almost never	Seldom	Some-times	Often	Very often
21.	1	2	3	4	5	36.	1	2	3	4	5
22.	1	2	3	4	5	37.	1	2	3	4	5
23.	1	2	3	4	5	38.	1	2	3	4	5
24.	1	2	3	4	5	39.	1	2	3	4	5
25.	1	2	3	4	5	40.	1	2	3	4	5
26.	1	2	3	4	5	41.	1	2	3	4	5
27.	1	2	3	4	5	42.	1	2	3	4	5
28.	1	2	3	4	5	43.	1	2	3	4	5
29.	1	2	3	4	5	44.	1	2	3	4	5
30.	1	2	3	4	5	45.	1	2	3	4	5
31.	1	2	3	4	5	46.	1	2	3	4	5
32.	1	2	3	4	5	47.	1	2	3	4	5
33.	1	2	3	4	5	48.	1	2	3	4	5
34.	1	2	3	4	5	49.	1	2	3	4	5
35.	1	2	3	4	5	50.	1	2	3	4	5

(Remember you are rating actual classroom practices)

INDIVIDUALISED CLASSROOM ENVIRONMENT QUESTIONNAIRE (ICEQ)

Scale Allocation and Scoring Procedure

Personalisation		Participatcn		Independence		Investigation		Differentiation	
1	+	4	-	5	-	3	-	2	-
9	+	6	+	11	+	8	+	7	+
10	+	14	+	22	-	13	+	12	-
15	-	18	+	25	-	17	-	16	+
23	+	21	-	28	-	20	+	19	+
26	-	32	+	29	-	27	+	24	-
35	+	38	-	33	-	31	+	30	+
39	+	42	+	34	-	37	+	36	+
44	+	45	+	43	-	41	+	40	-
46	+	49	+	50	-	48	+	47	-

Items designated + are scored by allocating 1, 2, 3, 4, 5, respectively, to the responses Almost Never, Seldom, Sometimes, Often, and Very Often. Items designated - are scored in the reverse manner. Ommitted or invalid responses are given a score of 3.

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